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ABSTRACT

Wildlife is often described as one of Alaska's most important and valuable resources. Helping wildlife can take many forms. In this educational packet, a variety of activities are included to help intermediate students understand which human activities help wildlife and which harm wildlife. In addition, suggestions on planning hands-on projects to improve wildlife habitat or to become involved in decisionmaking about Alaskan wildlife issues are included. The activities included in this packet represent adaptations and combinations of activities from past years and from Project Wild under the unit theme "Together, We Can Help Wildlife." The four lessons included in this guide contain background information for teachers, introductory activities and ideas for curriculum integration. Examples of Alaskan food webs and food chains, game pieces, seven sets of instructions for investigating different kinds of wildlife, and "Etiquette for Wildlife Watchers" are included in an appendix. (CW)

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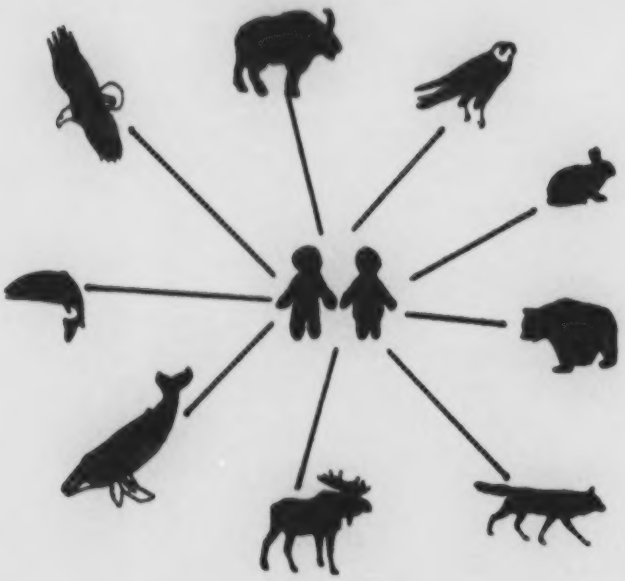
Alaska Wildlife Week

Upper Elementary Teacher's Guide



Unit 7. Together, We Can Help Wildlife. **April 23-29, 1989**

Alaska Department of Fish and Game -- Division of Wildlife Conservation
Nongame Wildlife Program

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Alaska Wildlife Week 1989

INTRODUCTION

Wildlife is often described as one of Alaska's most important and valuable resources. But few people think of wildlife in such general and somewhat remote terms. "Alaska wildlife," instead, is, first and foremost, the wild animals you and your students encounter on a daily basis as you wake up to warblings and chirpings in spring, or you ski or dog mush across a variety of tracks through the snow during winter. If, like many Alaskans, you hunt, trap, or fish; then you have necessarily learned something about the ways of the animals you pursue as well as the types of areas where you are most likely to find them. Or you may be inspired to bring home a particularly beautiful shell, or a take a photograph, or to create artwork from your memory of a particularly beautiful wild animal or scene. Most Alaskans have personal experiences with the wildlife species that live in Alaska. The areas where we live and recreate are shared with wildlife. Many depend upon fish and wildlife to some degree for food or clothing or the source of materials for artwork and handicrafts. The 1989 theme, "**Together, We Can Help Wildlife**" celebrates the fact that many Alaskans are aware of and are participating in activities that benefit wildlife directly or indirectly.

Helping wildlife can take many forms. In this educational packet, a variety of activities are included to help students understand which human activities help wildlife and which can harm wildlife. In addition, some "how-tos" on planning hands-on projects to improve wildlife habitat or to become involved in decision-making about Alaskan wildlife issues are included. Finally, a list of many resources is available to help your class get started on a particular type of project.

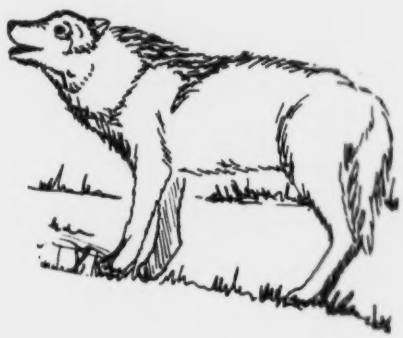
This year for the first time since Alaska Wildlife Week was initiated in 1983, we have not created a new packet of materials. Rather, we have **combined and adapted activities from past years** and from the Project Wild curriculum into a unit with the theme, "Together, We Can Help Wildlife." We hope that many of you have integrated past Alaska Wildlife Week materials into your curriculum so you can use this year's ideas as a means to **extend** and **reinforce** basic concepts about Alaska ecosystems and management of Alaska's fish and wildlife. We have included several ideas for doing so for each activity and referenced the sections of the previous Teacher's Guides that provide background information for the teacher and introductory or additional activities. We encourage you to review these sections if you decide your students need additional preparation to make the best use of activities included in this year's unit. We are working to make more copies of past units available; in the meantime, check your school libraries for copies.

The Alaska Wildlife Week series now includes units related to ecology and ecosystems in general (Unit 4 - We All Need Each Other) and to three major Alaska ecosystems of Wetlands (Unit 2 - Water, Wetlands, and Wildlife), Forests (Unit 5 - Alaska's Forests ... more than just trees), and Tundra (Unit 6 - Alaska's Living Tundra); and units related to major wildlife management concepts of habitat (Unit 1 - Be It Ever So Humble ... there's no place like habitat) and wildlife population dynamics (Unit 3 - Wildlife for the Future). As we have noted in the Teacher's Guides, many of the activities developed about one Alaska ecosystem can be adapted for use for the ecosystem with which your students are most familiar, although we encourage you to continue to teach the students in Barrow about Alaska's coastal forests and the students in Ketchikan about tundra. The general concepts are applicable in every ecosystem and form the basis for the understanding of **how** human actions truly affect wildlife.

The Teacher's Guides are organized so that the lessons build upon those previous. The student skills and the subjects are noted to allow for curriculum integration. All the activities were designed to help students develop or improve skills and knowledge in science, social studies, language arts, math, and/or art. Easy-to-duplicate worksheets may be used to review, reinforce, or evaluate student understanding of the lessons in this unit.

Please feel free to adapt and modify activities and worksheets to best suit your teaching style, students' learning styles, and your location and situation. Three separate Teacher's Guides were prepared -- one for Primary (K-3), Upper Elementary (4-6) and Junior/Senior High School. Check to be sure you have the one that best matches your students' knowledge and thinking skills.

We hope you will use these materials during Alaska Wildlife Week in 1989, as well as throughout this and other years. Please send any comments or suggestions about this project to: Alaska Wildlife Week, Alaska Department of Fish and Game, Division of Wildlife Conservation, P.O. Box 20, Douglas, AK 99824.



Unit 7. TOGETHER, WE CAN HELP WILDLIFE

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LESSON 1

Students will learn that human actions can affect wildlife and ways that human activities can help or harm wildlife.

BACKGROUND. Helping wildlife can take many forms. Human actions can benefit wildlife if they benefit individual animals, individual species, an ecosystem in which wildlife is a part, or if they help maintain global conditions upon which wildlife depend. While many activities are specifically undertaken to actively help wildlife, other actions that maintain conditions suitable for wildlife or avoid harming wildlife are equally important.

Helping Individual Wild Animals

You and your students are probably aware of things that people do or have done to help individual wild animals. The well-publicized rescue of three gray whales trapped in the ice at Barrow in fall, 1989, is a dramatic example of the large amount of human concern about the perceived suffering and imminent death of individual wild animals that could be prevented by human effort. People often try to care for sick or injured wild animals, many of which are hurt as a result of human actions such as wounding gunshots or litter that entangles or poisons. Millions of people in the U.S. feed birds year-round. When you first ask your students to think of things that help wildlife, they will likely list actions that help individual animals.

Often, humans help individual wild animals by the things they don't do, rather than by the things they do. When people encounter wild animals, they can easily disturb them with noise, chasing, or by just approaching more closely than the animal can tolerate. Tolerance for human activity differs for the raven that lives close to humans and learns quickly to feed on human garbage to the wolf which requires large expanses of wild lands. Nearly all wildlife species have periods in their life cycle when they are more sensitive to disturbance, usually during breeding or raising their young.

Helping Wildlife Populations

Many people are engaged in wildlife research, either as a volunteer or as a career. While they often work with many individual animals, they are generally concerned with **populations** of animals in relation to the desires or needs of people who use fish or wildlife. When people desire or need to harvest animals through hunting, trapping, and fishing; then the efforts of researchers and managers are directed at monitoring or ensuring that sufficient

numbers of animals are available over time to meet the demands. Similarly, when humans want to view or enjoy wildlife in ways that don't require harvesting (e.g., viewing, photography), then efforts are directed at maintaining this use, by monitoring and regulating human activity so that sensitive species are not displaced or disturbed. When human demands exceed what populations can sustain, then decisions are required to allocate wildlife populations to satisfy some, but not all, of those demands. In some cases, people can do things that result in increases in wildlife populations, such as rearing fish in hatcheries.

Your students may be less familiar with the concepts involved in managing wildife populations.

Unit 3 of Alaska Wildlife Week (Wildlife for the Future) focuses on these concepts. Several activities from Unit 3 are included in the Upper Elementary and Junior/Senior High versions of this packet. For additional teacher background, please refer to the Teacher's Guide for Unit 3.

The Importance of Habitat

The paramount factor in the potential or maximum size of wildlife populations is the amount of suitable **habitat** that exists. One way to think of a fish or wildlife population is in terms of a pie. A portion of the pie must remain after all the factors which cause deaths, including human actions, occur; in order to replenish the population through reproduction and births. But if the population is the pie, the habitat is the pie tin which ultimately limits the maximum size the population habitat's **carrying capacity.** Maintaining habitat quantity and quality is the key to healthy and abundant fish and wildlife populations.

Habitat is the scientific term for an animal's home. An animal's habitat includes **food, water, shelter**, or cover, and **space**. Because animals need food, water, shelter, and spaceto be available in a way that is suitable for their needs, we say that these things must be available in a **suitable arrangement.**

For ideas on how to present the concept of habitat to your students, refer to Unit 1 of Alaska Wildlife Week or Project Wild activities such as The Beautiful Basics, Everybody Needs a Home, Habitracks, and What's That, Habitat?

Unfortunately, many things people do harm wildlife by reducing or degrading habitat. Some of these activities may be necessary to meet other human needs for housing, food, or places for commercial or industrial development. People can help wildlife by considering the effects of all human actions on fish and wildife and minimizing damage or loss of habitat as much as possible. In some cases, the benefits of maintaining

habitat outweighs the benefits of the activities that will degrade it. People play an important role in participating in political land-use decisions which weigh competing demands for publically-owned lands.

People also do things to improve habitat, such as building fish ladders so fish can migate up steep sections of rivers to suitable upstream habitat or building nest boxes for birds to increase the amount of nesting habitat. Other habitat improvement projects occur after habitat has been degraded by previous human actions. As examples, streams are restored after being damaged by logging or construction of roads or pipelines. Nest boxes are built for birds after natural nesting habitat has been reduced. However, it's important to understand that current efforts to improve or restore degraded habitat in no way equals or compensates for the large-scale habitat alteration and loss that occurs from many human activities.

Fish and Wildlife as Ecosystem Partners

A single species' habitat involves other living things. For example, plants can be food items, shelter from wind, or a safe hiding place from predators. Many species are interrelated and interdependent in **ecosystems**.

Very simply, the critical relationships of ecosystems involve the question of "who eats whom?" Food chains or webs are formed by these relationships. (A listing of "Alaska Food Chain and Food Web Examples" is included in Appendix 1 of this unit for reference in carrying out the activities using animals that your students are familiar with.)

Large-scale human development activities and even small-scale human activities can affect the entire ecosystem of which wildlife is a part. One objective of this unit is to help your students understand that many things people do affect wildlife indirectly by affecting seemingly unconnected ecosystem components. The ecosystem is also a pie tin, which contains the collective habitat or home of interconnected living things and their non-living support system (the sun, soil, air, and water).

Unit 4 of Alaska Wildlife Week (Web of Life) contains teacher background information and many activities to teach food chain and food web concepts. Four Alaska Wildlife Week units include teacher background and activities about ecosystems in general (Unit 4) and specific Alaska ecosystems: Wetlands (Unit 2), Forests (Unit 5) and Tundra (Unit 6). The Aquatic Project Wild Guide includes a "Guide to the Ecosystem Concept." With the use of these previous materials, activities in this unit about helping wildlife can be used as extensions to a unit on one of the Alaska ecosystems.

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ETHI-THINKING

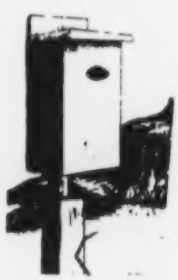
OBJECTIVE:

Students will generate a list of activities that can help or harm wildlife.

Subjects: Social Studies, Science, Language Arts
Skills: Analysis, description, discussion
Group Size: any
Setting: Indoors or outdoors
Key Vocabulary: harm, wildlife

Background:

This introductory activity can be used with little preparation to have students begin thinking about how human activities affect wildlife, or it can be used as a review after your class has completed lessons from other Alaska Wildlife Week units. If you are studying a specific Alaska ecosystem (forest, tundra, wetland, ocean), then discussion and this unit can be geared to the human actions that occur in that ecosystem. The introductory activity in Lesson 3 reviews and extends this lesson.



PROCEDURE:

1. HAVE STUDENTS THINK OF THINGS THAT PEOPLE DO THAT AFFECT WILD PLANTS OR ANIMALS. Encourage students to brainstorm activities that people do that might affect wild plants or animals and decide whether it helps or harms them.

Examples of helpful things might be:
- Feeding birds during winter
-- Caring for sick or injured animals
- Leaving bird nests alone

Some examples of harmful activities might be:
- Driving vehicles on wetlands or tundra
- Littering
- Picking up baby animals
- Chasing or scaring animals

2. WRITE THE ACTIVITIES DOWN AND KEEP THEM FOR USE IN LATER ACTIVITIES.

EXTENSION: HAVE STUDENTS THINK OF THINGS PEOPLE DO THAT AFFECT A PARTICULAR ECOSYSTEM (FOREST, TUNDRA, WETLAND, OCEAN).

ADAPTED FROM: PROJECT WILD "ETHI-THINKING," ALASKA WILDLIFE WEEK, UNIT 5.

.....SCIENCE / SOCIAL STUDIES / ART

OBJECTIVES: Students will learn that human activities can help or harm populations of wildlife by: 1) directly reducing habitat components of food and cover, 2) as a function of their cumulative effects on wildlife populations.

Four activities that can be integrated into your curriculum are included in this lesson. **Shrinking Habitat**, from Project Wild, is an excellent lesson for the first objective. **Wildlife and Harvest** focuses on the second objective from the perspective of wildlife harvest. **Brant for the Future** and the **Caribou Game** integrate both objectives. The latter two activities are included in the Games and Projects Book, revised from its original printing with Unit 3 of Alaska Wildlife Week and redistributed with this unit.

PLAY THE THE CARIBOU GAME

BACKGROUND: This activity illustrates the population dynamics of caribou herds and the factors which affect the number of deaths and births in the population each season. The game can be played for several rounds representing successive years to simulate cumulative effects of changes in population size. A broad range of human activities with effects on the population are included: entanglement, research, disturbance by airplanes, development and loss of habitat, legal and illegal harvest, diseases introduced by livestock, and train and car accidents.

PLAY THE WILDLIFE AND HARVEST GAME

Specific Objective: Students will recognize that harvest of fish and wildlife must be limited to protect wildlife populations.

BACKGROUND: This activity simulates the effects of unlimited harvests, permit hunts, and illegal harvests. Any animal that is regularly harvested by hunters or fishermen can be used as the example. (Make copies of Wildlife Cards from previous Alaska Wildlife Week Units).

PLAY "BRANT FOR THE FUTURE" GAME

Specific objectives: 1. Students will learn that decisions about wildlife use and habitat development have a cumulative effect on wildlife populations by a simulation involving the cumulative effects of decisions made by people throughout the summer, winter, and migratory range of a population of brant geese.
2. Students will practice addition, subtraction, multiplication, and division skills by calculating changes in a population size.
3. Students will practice graphing information and interpreting graphs, by working together on a graph of population changes.

BACKGROUND: For an introduction to factors affecting wildlife population dynamics, show the film/tape program, "Wildlife for the Future." Check your school library or the state film library for a copy. The Population Puzzles included in the Games and Projects book provide simulations of how wildlife researchers and managers learn about populations and arrive at solutions to problems.

EXTENSIONS:

Arctic-nesting species of brant and other geese are currently at very low levels. A curriculum which combines and adapts activities from Alaska Wildlife Week, Project Wild, and other curricula has been developed to teach students about the issue involved and ways to help rebuild the geese populations that nest on the Yukon-Kuskokwim Delta of Alaska. Contact the U.S. Fish and Wildlife Service, 1011 E. Tudor Avenue, Anchorage, AK 99518 for additional information about the Teach About Geese curriculum

Other extensions from Project Wild: **Migration Headache, Hooks and Ladders, No Water Off a Duck's Back** (effects of oil pollution on feathers).

Neqlernat, 'Leqlernat
(Pacific Black Brant)

SHRINKING HABITAT

Objectives

Students will be able to: 1) describe some effects of human development of land areas on plants and animals previously living in the area; 2) evaluate the importance of suitable habitat for wildlife; and 3) recognize that loss of habitat is generally considered to be the most critical problem facing wildlife today.

Method

Students simulate a process of land development in a physically involving activity.

Age: Grades 4—7
Subjects: Social Studies, Science
Skills: application, comparing similarities and differences, description, discussion, evaluation, generalization, kinesthetic concept development, observation, synthesis
Duration: one 45-minute period or longer
Group Size: minimum of six students, with one developer, one carnivore, three herbivores, and one tree
Setting: indoors or outdoors; large area with room for people and props

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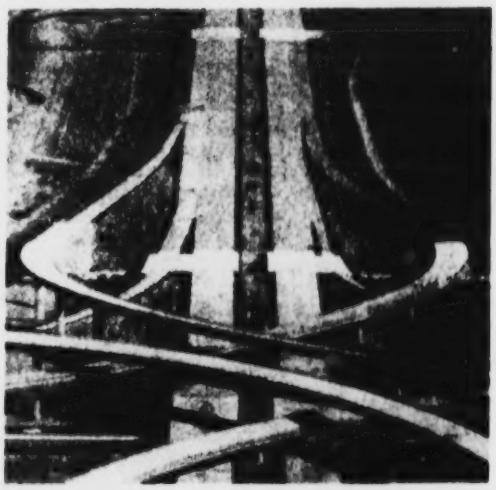
4. Provide each "herbivore" with:
- two desks or chairs to use as "shelter" (or string or hula hoops);
- three pieces of green construction paper to represent food;
- one piece of blue construction paper to represent water; and
- some of the vegetation portrayed by students.

Provide each "carnivore" with:
- one desk or chair to use as a "lair" (or string) or hula hoop);
- space equivalent to that used by three herbivores;
- three herbivores as a potential food source;
- one piece of blue construction paper to represent water; and
- some of the vegetation portrayed by students.

5. Ask the "herbivores" to arrange the food, water, and shelter—including the students who are "vegetation"—in a space to represent their habitat. Once the herbivores have arranged their habitat, ask the "carnivores" to move into the area to establish their lairs and water sources, keeping an eye on the herbivores as possible food sources. For added interest, suggest that the students identify what particular kind of animal they are, and role-play its characteristics. (This phase takes about ten minutes, with the developers planning while the herbivores and carnivores arrange their habitat.)

6. Once all the animals are established in their habitats, it is time for the developers to enter the picture. These developers have been given the opportunity to create a housing and shopping area. (They may use three to seven minutes to construct their development, explaining their actions as they take them.) They are restricted in how much space they can use. They may use the space equivalent to that used by three herbivores. The developers may use the sheets and blankets to build their development. They may remove trees, represented by students (without physically hurting the students), shelter, (represented by desks), food and water.

7. Once they have constructed their development, engage all of the students in a discussion of what happened. What action took place? With what consequences? Would or did any animals die? From what causes? Could the developers have done anything differently to change the consequences? Could they have developed several scattered small areas instead of one large area, or vice versa, with what effects? Would it have reduced negative consequences for wildlife if they put the development in a different area of the habitat? Rather than negative consequences, were there positive consequences? If so, what were they? How were they achieved? Ask the students to consider and discuss what seemed realistic about the activity, and what did not. For example, sometimes development can take place that enhances the area for some kinds of wildlife. Often, however, it will not be the same kinds of wildlife that were in the area before development. Planners and developers can sometimes add to the vegetation in an area, creating additional shelter and food for some kinds of wildlife, and make water sources available under some conditions, if there is insufficient water in the area.



8. Ask the students to summarize some of the possible impacts on wildlife from human activities like development of land areas. Are there places in your community where wildlife habitat has been lost by human development? Are there places where wildlife habitat has been enhanced by human activity? What choices, if any, are there to development of previously undeveloped areas? What trade-offs are involved; for example, in developing vacant areas within communities rather than undeveloped areas outside of communities? If development does take place, what kinds of actions can people take to minimize the negative consequences for wildlife, vegetation, and other elements of the environment? What about possible economic costs? Social costs? Ecological costs? Aesthetic costs? etc. Discuss loss of habitat as something that is affecting wildlife all over the planet. Ask the students to summarize the importance of suitable habitat for wildlife. Discuss the students' concerns and recommendations.

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Background

All around us, and all over the planet, wildlife habitat is being lost. Whenever an area of land is paved for a shopping center, divided and excavated for homes for people, and sometimes when it is plowed to grow a crop—small animals lose their homes, and frequently their sources of food and water. As these small animals disappear, so too do the larger animals that previously depended upon the smaller animals in the food chain as a source of food. Animals that cannot tolerate human intervention may also disappear without any direct relationship to the food chain. (For example, see "Too Close For Comfort.")

Students can observe this phenomenon near their homes and schools, or at least in their region. This process is happening in large ecosystems and small, all over the earth.

For example, many wetlands on the planet have been filled in and drained to make land for farming and homes. When they are filled in, many kinds of water birds, reptiles, amphibians, crustaceans, and other life forms—including a wide variety of vegetation—are lost. Sometimes the animal forms can move on; most often they cannot.

Some of the tropical forests of the planet have become extremely vulnerable in recent years. Scientists estimate that huge numbers of plant and animal forms exist in these forests that have not even been identified as yet. They are tremendously important sources of the earth's biological diversity. In fact, some scientists warn that as these genetic pools are reduced, the flexibility and thus capacity to survive of the remaining plants and animals on earth will ultimately be reduced.

The major purpose of this activity is for students to simulate some of the potential impacts of land development on wildlife and its habitat, to recognize that this process is one that is taking place in areas all over the planet, and to understand that loss of habitat is generally considered to be the most critical problem facing wildlife today.

Materials

green and blue construction paper; classroom desks, tables or chairs; five or six large bedsheets or blankets for a student group of about 25

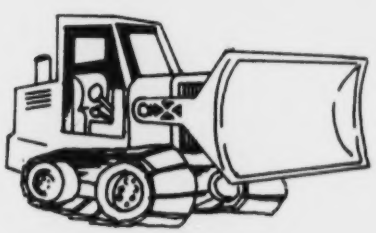
Procedure

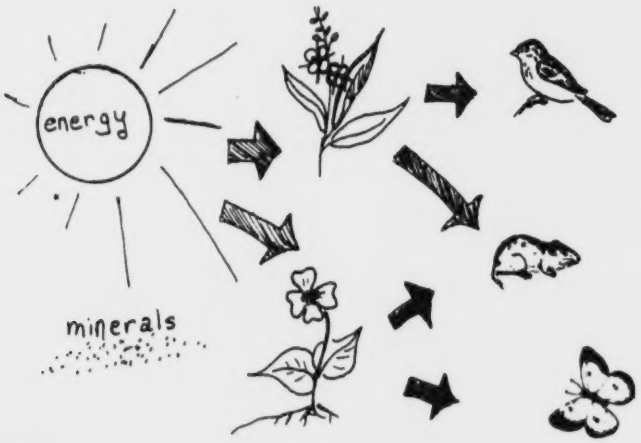
1. Review with the students the elements necessary for a habitat (food, water, shelter, and space arranged suitably for the particular animal).

After some discussion to make sure that the elements of habitat are clearly in mind, tell the students that in this activity they will be simulating wildlife in its habitat.

2. Divide the students into four groups: **herbivores, carnivores, vegetation** (trees, shrubs, grasses, etc.), and people who will be **land developers.** If the students are not familiar with the terms "herbivore" and "carnivore," provide them with working definitions of those terms (herbivore—a plant-eating animal; carnivore—a meat-eating animal; and although not needed for this activity, omnivore—an animal that eats both plants and animals). Plan for three times as many herbivores as carnivores with a small number of developers in proportion to the other two groups. The numbers (amount) of vegetation may vary. For example, two developers, three carnivores, nine herbivores, and six trees or bushes (vegetation).

3. Establish a large area—either in the classroom, with tables, chairs, and desks moved to the sides of the room, or outside—that can be used to simulate the wildlife habitat area before development. The "land developers" are to stay on the sidelines at this time, simply observing the undeveloped land and its wildlife inhabitants—or meeting on their own, nearby, to make plans for development. In fact, they can make their entrance rather suddenly once the wildlife habitat has been established—simulating the arrival of heavy construction equipment.





Extensions

1. Conduct this activity twice, with the students trading roles the second time. When the former wildlife become land developers, they could see if they could produce a development plan that could benefit the area for people and wildlife in some ways. The activity can also be conducted to show differences between developing the entire area—with likely loss of all wildlife in the area—to developing only part of the area, with some wildlife likely to survive.
2. Ask students to complete the following sentence, and discuss their response: "If I were going to build a house for my family in a previously undeveloped area, I would . . ."

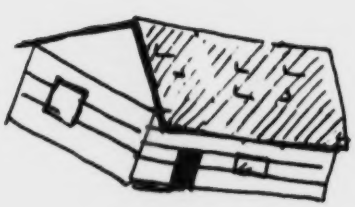
Evaluation

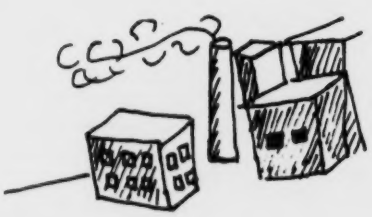
Name and describe three animals or plants which used to live in your area, but no longer do.

Describe the changes that seem most responsible for eliminating each of these plants or animals.

Suggest and evaluate the advantages and disadvantages, if any, of possible actions that could have been taken to prevent the elimination of these plants or animals from the area.

Name one kind of wildlife that would do better, and one kind of wildlife that would do worse, in areas in which humans cut down a forest and planted grass; dammed a creek to flood a valley; put in a housing development with large lawns and many shrubs; built a city on a lakeshore with crowded skyscrapers.





WILDLIFE AND HARVEST . . . . . SOCIAL STUDIES / SCIENCE

OBJECTIVE: Students will recognize that harvest of fish and wildlife must be limited to protect wildlife populations.

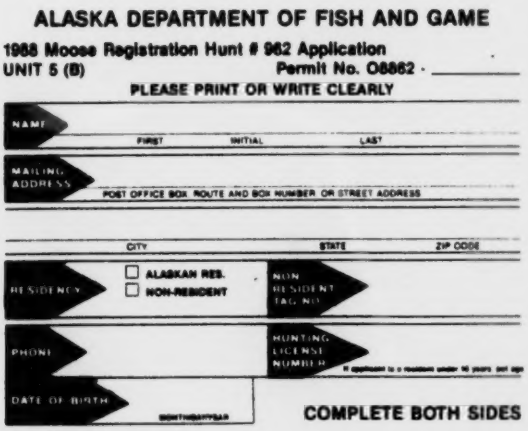
BACKGROUND: This activity simulates the effects of unlimited harvests, permit hunts, and illegal harvests.

SKILLS: Counting, reasoning, applying scientific knowledge to a social question

MATERIALS: 50 cards showing an animal that is harvested by humans (Photocopy one of the Wildlife Cards from Alaska Wildlife Week units.), a number of slips of paper equal to the number of students in the class with 3/4 labelled "This is not a permit," and 1/4 labelled "Hunting Permit--You may harvest 2 animals," and additional slips of paper labelled "This is not a permit. You harvest 2 animals anyway."

Procedure:
Preparation: Tape a number of wildlife cards equal to the number of students in the class onto a simple sketch of an ecosystem drawn on the blackboard.

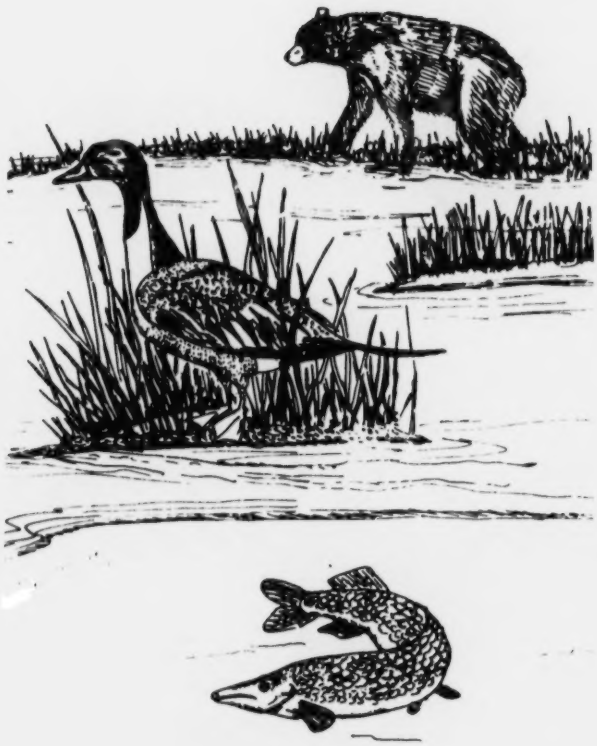
1. STUDENTS HARVEST ANIMALS. Ask students to pretend they are hunters or fishermen, and come harvest an animal from the ecosystem. Each student should come up and take one. Discuss what happened. Have students return the animals to the board.


ALASKA DEPARTMENT OF FISH AND GAME
1988 Moose Registration Hunt # 982 Application
UNIT 5 (B) Permit No. 08882 - _____
PLEASE PRINT OR WRITE CLEARLY
NAME
FIRST INITIAL LAST
MAILING ADDRESS
POST OFFICE BOX, ROUTE AND BOX NUMBER OR STREET ADDRESS
CITY STATE ZIP CODE
RESIDENCY
ALASKAN RES.
NON-RESIDENT
NON-RESIDENT TAG NO.
PHONE
HUNTING LICENSE NUMBER
DATE OF BIRTH
COMPLETE BOTH SIDES

2. STUDENTS RECOGNIZE THE NEED FOR LIMITS. Ask how the consequence of unlimited harvest could be avoided. Can students decide that humans must limit the number of animals they harvest? If humans do limit the harvest adequately, animals may survive to raise more young, and replace the animals that were harvested by people. Explain that is why hunters and fishermen must get a license and take only the number of animals that the license allows. If too many people want to harvest animals, we have to limit the number of hunters by only giving out a certain number of permits. The Alaska Department of Fish and Game does this in some cases by a drawing.

2. STUDENTS HOLD A "PERMIT HUNT." Have students count the number of animals on the board (in a population). Then, have each student draw a slip of paper from the jar. Only those who receive a harvest permit are allowed to take an animal. Ask the permittees to do so, then have all the students return their slips to the jar. Then explain that half of the remaining animals are females, and they each produce one young the next spring. Place additional cards on the board to represent the young. Ask students to count the number of animals on the board now. (It should be the same as before.) Discuss why.

4. ILLEGAL HUNTERS TAKE EXTRA ANIMALS. Have students hold another permit hunt (but this time add the slips that instruct certain students to harvest illegally). Repeat the above step. Count the number present, then hold a harvest, show the results of animals reproducing, then recount the number present. What happened? (The number should have dropped.) Can any students explain why there aren't as many animals as before? If desired, repeat this process 2 or 3 times to show the inevitable decline in numbers of animals. Ask students whether or not they think it is important to obey hunting and fishing laws, and why. Do they understand the consequences of people not obeying the laws?



Ecosystems and People • **Science / Social Studies / Art**

OBJECTIVE: Students will learn that human actions can help or harm wildlife indirectly by affecting living and non-living components of the ecosystem upon which they depend.

BACKGROUND: This activity builds on the concept of an ecosystem with many interacting parts, both non-living and living. Teacher background information and activities that teach your students to distinguish between non-living and living things are included in Unit 4 of Alaska Wildlife Week materials. Also, background and activities to introduce ecosystem concepts and many Alaska-specific examples are included. Additional activities and examples are included in Unit 5 for Alaska's forest ecosystems and Unit 6 for Alaska's tundra ecosystems.

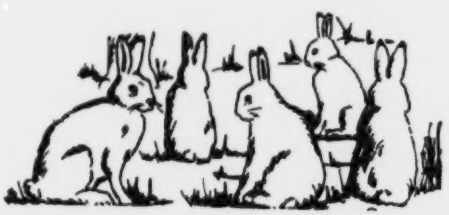
MATERIALS: Butcher paper (if you want to save the drawing for use in the Favorite Animal activity in Lesson 2).

PROCEDURE:

1. HAVE THE CLASS MAKE A LIST OF ALL THE THINGS PEOPLE DO AROUND YOUR AREA OR IN A SPECIFIC ECOSYSTEM (FOREST, WETLAND, TUNDRA, OCEAN):
Discuss how each of these activities might directly affect the non-living environment (air, water, and soil) or living things (plants, animals, fungi, microscopic organisms). Write the effects on the board next to the activity and whether it is helpful or harmful and why.

2. CHOOSE AN ANIMAL THAT LIVES IN YOUR AREA OR IN THE ECOSYSTEM YOU ARE STUDYING:
Have students list the living and non-living things needed by this animal. (Does the animal drink water? Breathe air? Does the animal need oxygen made by the plants? Which living things does it eat? What other living things may it use in some way? List the different things it needs on the board and draw lines to connect these to the animal. Then, have students figure out what each listed living thing needs. (Do the plants need soil? sunlight? water? pollinaters? seed carriers? decomposers to recycle minerals? What do each of the living things eat--do they depend on other living things?) List these and draw lines to show connections.

3. REVIEW THE LIST OF THINGS PEOPLE DO THAT AFFECT LIVING AND NON-LIVING THINGS:
How many of the activities affect something that is connected to the animal of concern by lines? These activities could affect populations of that animal. Students should recognize that everything humans do can affect living things. Discuss and compare the effects of one person doing a certain activity, and 100, 1000, or 4 billion doing that activity.



LESSON 2

Students will learn to evaluate changes in ecosystems that result from human actions.

BACKGROUND. Lesson 1 was designed to **introduce or review** concepts of wildlife habitat, food chains, and ecosystems and to have your students begin thinking about how humans can affect wildlife. The second lesson provides activities for the students to begin observing changes in food chains and ecosystems that result from human activities and **evaluating** the changes in terms of what they might mean for wildlife and for humans.

The many inter-relationships between living things, and between living things and the non-living environment make ecosystems both resilient and fragile. Any change in the non-living surroundings, or in a population of any living thing, is likely to cause many other changes within an ecosystem. Changes in the non-living surroundings can affect all living things, because all use air, water, and minerals, and are affected by temperature, humidity, and light. A change in a population of one living thing will affect the populations of all the other living things it interacts with--through food chains and webs, or other kinds of interactions. The resulting changes in these populations, may in turn, affect the populations of all of the different living things these interact with. This chain reaction of changes means that a single change--in the non-living surroundings or in the population of a single kind of living thing--can indirectly affect many, or all, the living things in that ecosystem.

Ecosystems can and do tolerate and absorb changes in the non-living environment (such as weather and climatic changes, earthquakes, floods, etc.). Ecosystems can also tolerate and absorb changes in the numbers and kinds of living things present; extinction of certain species and invasion by others are natural and, over geologic time, constant occurrences. All ecosystems are constantly changing.

However, too many or severe changes in either the non-living surroundings, or the populations of living things can causethe many complex relationships in an ecosystem to be disrupted permanently. While such change may make the area uninhabitable for its present residents, species suitably adapted to the changed environment may colonize and become established. A new ecosystem may thus appear, often after a long period of time, with a whole different community of living things interconnected by different food webs and symbioses.

Nearly every human activity affects ecosystems. Each change may have desirable or undesirable consequences. The important thing to recognize is that every activity has potential consequences and to learn how to evaluate those consequences. Even an activity that seems only to affect insects, or fungi, the upper atmosphere, or ground water supplies can have far-reaching consequences.

OBJECTIVES:

Students will: 1) review the parts of an ecosystem and their interconnections by making a 3-dimensional model of the ecosystem around them and 2) recognize that people can do things to help or harm ecosystems.

Sujects: Science, Social Studies,
Skills: Observation, evaluation, generalization
Group Size: Small groups, pairs
Setting: Indoors
Key Vocabulary: ecosystem, effects

MATERIALS:

A wide variety of art materials, such as construction, butcher, and crepe paper, scissors, glue, staples, paint, masking tape, and clay, Human Action Cards for Forest, Wetland, or Tundra (in appendix to this guide).

PROCEDURE:

1. REVIEW THE CONCEPT OF AN ECOSYSTEM:
Review the concept of an ecosystem and the variety of living and non-living things that occur in every ecosystem.

2. CONVERT THE CLASSROOM INTO AN ECOSYSTEM:
Ask students to convert the classroom, or a portion of the room into an Alaska ecosystem (forest, tundra, wetland, or ocean). Review the various kinds of art techniques students have used during the year and encourage them to be creative in thinking of ways to portray living and non-living things. You may want to assign one group each to construct models of animals, plants, fungi, protists (seaweeds, algae, and protozoans), and non-living things. Or assign more specific groups (birds, mammals, mushrooms, lichens, trees, flowering plants, etc.) to individual students. Challenge students to portray representatives of all the living and non-living things in the ecosystem. They can observe or use references to find out the variety of things that occur, or you can pass out Wildlife and Ecosystem Partner Cards from previous Week units (See Wetland Wildlife Cards, Unit 2; Ecosystem Partner Cards, pp. 34-37, Unit 4; Primary Forest Wildlife Cards, pp. 18-27, Unit 5; and Tundra Cards, Supplement to Unit 6). Encourage students to create models that portray the colors, textures, and size of the things they portray.

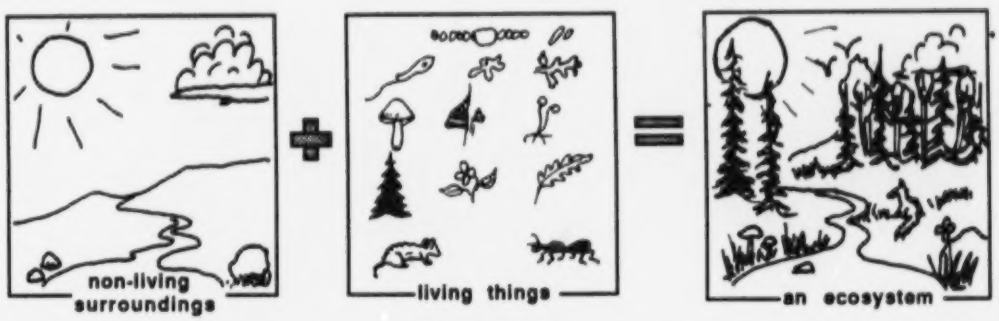
3. STUDENTS EVALUATE THE MODEL:
To evaluate the model, choose individual animals and help the class determine whether the ecosystem includes all the things they need to survive. If not, have students add the missing items. If desirable, you can have students show all the ecosystem interconnections using lengths of string.

4. STUDENTS CHANGE THEIR ECOSYSTEM: Give each pair of students a Human Action Card for their ecosystem. Each of these describes a particular thing that people do that affects that particular ecosystem. Ask students to come up and pretend to do the activity described on the card. (For example, if their card says: "Some people leave cans, paper, and other trash in wetlands," the student could go get a piece of trash and toss it into the model. If the card says, "Some people cut down trees so they can use the wood to heat their homes," the student should remove some of the trees from the forest model.) Allow students to continue pretending to do these activities until their model is messed up (littered, most of the trees removed, etc.). Then, ask students to quit pretending and stop and look at what they have done to their ecosystem.

5. STUDENTS DISCUSS THE EFFECTS OF THEIR ACTIONS: Have students discuss how their model has changed. Are these changes good or bad? How do these changes affect the wildlife habitat? How do they affect the ecosystem? Does it still have clean air and water? Does it still provide homes for forest wildlife? Is it a beautiful place to hike? Explain that many ecosystems around the world have been and are being destroyed by people.

4. STUDENTS EVALUATE HUMAN ACTIONS: Ask each student to re-read his/her card and decide whether the action helps or harms wildlife or other living things in the ecosystem. Write two columns on the board: 1) Things that help wildlife or the ecosystem, 2) Things that harm wildlife or the ecosystem. Have each student come up to the blackboard and read the card they are holding. Then ask them to stand under the column they think that activity belongs in. If the class agrees, then write the action under that column.

When all students have come up and classified their action, discuss what should be done about the activities that harm wildlife or the ecosystem. Should they be against the law? Allowed to continue? What if people were not allowed to do this activity anymore? Would anything else be affected? (As examples, raise question such as whether humans could survive without wood to heat homes, without plastics made from oil, without paper to write on, metals to make machines, etc.) Students should recognize that some of the activities may be necessary for people to continue living the way we do. Ask students how we might be able to prevent losses of wildlife habitat and ecosystems and still have get other resources like wood or minerals.



PEOPLE AND ECOSYSTEMS - A FIELD INVESTIGATION

..... SCIENCE / SOCIAL STUDIES

OBJECTIVES:
Students will look for evidence of human activities and recognize that human activities affect ecosystems by comparing areas with and without human disturbance.

PREPARATION: **Pond Succession**, from the Project Wild Aquatic guide, is a good activity to introduce the concept of ecosystem succession. See also the **Succession Game** in Alaska Wildlife Week Unit 5 (Alaska's Forests), Upper Elementary Teacher's Guide.

SKILLS: observation, comparison, field techniques

MATERIALS:
Pencils, field notebooks or paper, clipboards or cardboard for a writing surface, equipment to carry out investigations (See Appendix), two outdoor sites -- one undisturbed site and one affected by human activities (a playground, parking lot or lawn is adequate, but you may want to choose a site that is affected by an activity such as logging, mining, litter, or agricuture; in a tundra or other type of wetland area, this could be a vehicle trail). Be careful not to compare a wet and dry site, or two sites with different aspects or slopes as these will vary due to factors other than human activities.

PROCEDURE:
1. STUDENTS INVESTIGATE AN UNDISTURBED SITE: Divide the class into teams and assign each team a component of the ecosystem to investigate: non-living surroundings, monerans and protists, fungi, animals in the soil, plants, birds, mammals, animals in the water; using the techniques in the "Ecosystem Investigation" section of the Appendix (reprinted from Alaska Wildlife Week, Unit 4). Have the students record their observations.

2. STUDENTS INVESTIGATE A DISTURBED SITE: Have students divide into teams again and perform the same investigations that they did at the undisturbed site.

3. STUDENTS COMPARE THE NUMBERS FROM THE TWO SITES: Use the numbers that the groups recorded to fill out an Ecosystem Investigation Sheet for each group. Then, have students make bar graphs of the numbers of kinds of plants, animals, and fungi at each site. Ask students which site was more interesting, or had the most variety of living things. Have them compare the differences between the disturbed and undisturbed site in terms of the relative number of species, different types of species, and densities of each species observed.(Severely-disturbed sites should have fewer types or lower densities, but less disturbed sites may have high densities of a few "weed"-type species.) Ask them why some types of plants or animals are found only in disturbed or undisturbed sites, but not in both. Can they explain why?

EXTENSION:

At a field trip site or a nature trail near your school (see the supplement to Alaska Wildlife Week Unit 5 to learn how to set up a Forest Learning Trail), set up a station at some site where humans have altered the ecosystem. See the "Human Activities - Instructions" and the "Classroom Follow-up" on page 19 of the Forest Learning Trail supplement for an activity that integrates science and social studies skills.

ART EXTENSION:

Take a large sheet of drawing paper (11 x 17) in the field. Have students fold it in half to form two 8 1/2 x 11 sheets; label one-half "A Wild Ecosystem" and the other side "The Ecosystem after Humans Changed It."

Have students observe each site and draw and color:
1) the non-living surroundings (try to get the exact color of the sky, the air, the water, and the soil),
2) the producers,
3) animal consumers (use your imagination to draw in pictures of the animals of which you only found signs) and
4) fungi.

FAVORITE ANIMAL . . . . . SCIENCE / SOCIAL STUDIES

OBJECTIVE:
Students will learn that in order to protect any kind of wildlife, we must protect their non-living surroundings and all the other living things they depend upon.

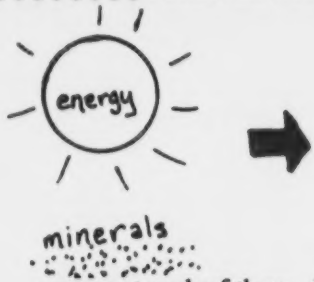
MATERIALS:
Large open area with grass or carpeting; reference materials on wildlife (may be able to do without).

BACKGROUND:
For this activity, you can use an animal that lives in your area or one from a specific Alaska ecosystem that your class has studied or is studying. See the appendix for food chain and food web examples from Alaska ecosystems.

PROCEDURE:
1. ELECT A FAVORITE ANIMAL:
Have the class nominate animals for the title "Our Favorite Animal," then take a vote to choose one.

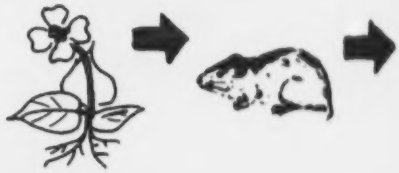
2. DESCRIBE THE ANIMAL'S ECOSYSTEM AND ASSIGN PARTS TO STUDENTS:
Assign 2 or 3 students to represent the favorite animal. Have the class list the parts of the non-living surroundings that their favorite animal needs--assign one student to represent each of the parts.

Have the class name the living things their favorite animal eats (write these on the board)--assign students to



represent each of these. Have students list 2 things eaten by each of these animals (again write on the board), and assign students to represent those. Have students list 2 or 3 living things that make the oxygen needed by their favorite animal; write these on the board and assign one student to represent each one. Determine if there are other living things that help any of the living things so far listed (don't forget pollinators, seed carriers, etc.). List these on the board, and assign students to represent them.

3. CHOOSE THE LEAST POPULAR LIVING THING:
Have the class choose the least popular living things listed (or have the class vote on their least favorite animal--from those listed on the board). Ask the class if they think it would matter if people did something that caused the unpopular thing to die out. (For example, if humans spread a poison that killed that organism, or destroyed its habitat).



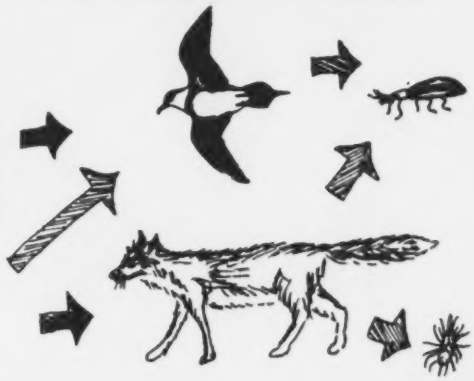
4. PLAY A GAME:
Explain that they are going to play a game to find out. Have students stand (or squat) in a circle on the grass or carpeted area. They represent parts of an ecosystem--but they are not yet an ecosystem, because they are all standing alone. In order to represent an ecosystem, they all must become interdependent. Ask them to place their hands on the shoulders of the person next to them. Then everyone should take a step toward the center of the circle and take the hand of the person just beyond the person next to them. (Hands should be grasped behind the back of the person next to each student.) Then have everyone lean back, knees straight, and walk their feet in toward the center. Then ask the student representing the unpopular living thing to let go. What happens? Was their favorite animal affected? Have the class discuss why we would need to protect all the living things listed on the board in order to protect their favorite animal.

Other Project Wild extensions include **Interview a Spider** (after students have done research on their animal) and **Deadly Links** (food chain bioaccumulation of pesticides).

ART EXTENSIONS:
Have the class make bumper stickers that say: **Help save** (name of their favorite animal), **Protect** (name of their least favorite living thing). Or have the class adopt the unpopular species. (Instead of adopting whales--adopt amphipods. Or instead of adopting hawks--adopt voles). Students can make posters, write poems, paragraphs, or banners declaring the importance of their unsung wildlife hero. Also, see the Project Wild activity **Cartoons and Bumper Stickers.**

Help save the peregrine falcon....
Protect Craneflies!

ART EXTENSION:
Have the students complete the worksheet **"Who Needs Who?"**



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Who Needs Who

Name _____

_____

_____

We want to conserve populations of this animal.	Circle all the living things that we'll need to conserve, if we want to protect the animal listed in the first column.
chickadee	woodpecker fungi tree insects
wolf	plants insects dall sheep certain bacteria and fungi
weasel	vole berry-producing plant fungi
harbor seal	fish tiny animals that live in the sea algae

Alaska Wildlife Week Unit 4, ©1986 ADF&G

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My Favorite Living Thing

Name_____

_____

(fill in the name of your favorite living thing)

This living thing depends upon:

_____ _____ _____ _____

(its non-living surroundings)

_____ _____ _____ _____

(the living things that make the oxygen it breathes)

_____ _____ _____ _____

(the living things that help the producers)

_____ _____ _____ _____

(the living things that my favorite living thing eats)

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

(the living things that each of these eat)

_____ _____ _____ _____

(any living things needed by any of the above living things)

In order to protect my favorite living thing, we are going to have to protect the _ _ _ _ _ _ _ _ _ _ to which it belongs.

Alaska Wildlife Week Unit 4. © 1985 ADF&G

LESSON 3

OBJECTIVE:

Students will develop a sense of personal responsibility for helping wildlife and avoiding or minimizing actions that harm the environment.

BACKGROUND. This unit is designed to allow students to apply the awareness gained from evaluating how human actions affect wildlife and the ecosystems upon which they depend. One introductory activity re-visits Ethi-thinking, the activity that introduced Lesson 1. The second introductory activity brings a resource manager to your classroom to describe "real-world" actions and potential careers working with wildlife. Subsequent activities are designed to make your students identify alternatives to actions that harm wildlife, including developing a personal code of ethics and becoming a "friend of the ecosystem."

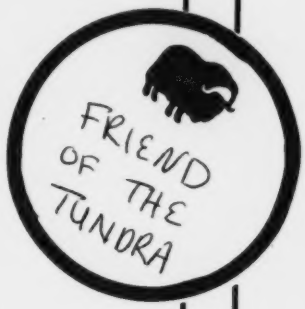
This lesson can prepare the students for Lesson 4, where the class takes on a wildlife-related issue or project. The index that follows Lesson 4 lists many specific issue or project-related activities from previous Alaska Wildlife Week materials. You may wish to review these if you plan to direct the activities in this lesson towards a specific issue or project.

For more background for you as the teacher about problems of use and conservation of specific Alaska ecosystems, refer to the following sections in past Alaska Wildlife Week materials:

Alaska's Wetlands: Water Pollution and You, page 33 and Table 1, Some Effects of Water Pollution on Wildlife, pp. 50-53, Unit 2 Teacher's Guide.

Alaska's Forests: Unit 5, Lesson 5, pp. 59-62, Upper Elementary Teacher's Guide.

Alaska's Tundra: Unit 6, Lesson 5, pp. 74-76, Jr./Sr. High School Teacher's Guide.



ETHI-THINKING, REVISITED

OBJECTIVES:

Students will 1) apply their evaluations of the effects of human activities on ecosystems to revise their list of activities that humans do that are helpful or harmful to wildlife, 2) discuss reasons why harmful activities are inappropriate, and 3) recommend alternative activities that are not harmful.

Subjects: Social Studies, Science, Language Arts
Skills: Analysis, generalization, description, discussion
Groups Size: Any
Setting: Indoors or outdoors

BACKGROUND:

This activity can be used to review and extend the initial concept of helping and harming wildlife. It is also a good introductory activity for the activities in this unit.

PROCEDURE:

1. REVIEW THE LIST OF ACTIVITIES FROM THE "ETHI-THINKING" IN LESSON 1:

Ask the students if they have changed their mind about any of the activities that they listed as helping or harming wildlife. Can they think of others?

2. DIVIDE THE CLASS INTO GROUPS AND PASS OUT THE HUMAN ACTION CARDS THAT SHOW ACTIVITIES THAT CAN HARM WILDLIFE:

Count students off into groups of 4 each. Hand out one card to each group. Ask them to discuss:
- What is happening?
- Could it harm wildlife? How?
- Does it seem appropriate or inappropriate behavior? Why?
- What else could happen that would satisfy human needs without harming wildlife or the environment?

3. HAVE THE GROUPS COMMUNICATE TO OTHER GROUPS:

Ask each group to report to everyone else about their feelings concerning what is happening in the picture and the alternatives they identified. Older students can dramatize their alternatives with skits, "commercials," songs, poems, etc.

Some people leave papers, cans, plastic, and other trash in the forest.

Some people plant trees in areas where the trees have been cut down or cleared.

Some people get together to plan how their town will grow and avoid building in wetlands as much as possible.

INVITE A RESOURCE MANAGER TO CLASS

OBJECTIVE:

Students will practice listening and questioning skills while becoming more aware of how resource managers help wildlife.

BACKGROUND:

This can also be used as a follow-up to Lesson 3 or as an introduction to "Can Do!"

MATERIALS: A local resource manager to come to your class (students in rural areas could write a letter from the class to a resource agency instead).

PREPARATION:
The Project Wild activity **Wild Work** is a good preparation for this activity.

PROCEDURE:

1. INVITE A LOCAL RESOURCE MANAGER TO CLASS. Ask a local resource manager to come to your class to dicuss careers related to wildlife, management of wildlife habitat, or other management activities that benefit wildlife. (You could ask someone from the Alaska Department of Natural Resources, the Alaska Department of Fish and Game, U.S. Bureau of Land Management, National Marine Fisheries Service, or U.S. Fish and Wildlife Service.) Ask these individuals to prepare a short talk on the topic and to address the importance of resource conservation, and to be prepared to answer student questions. Ask the manager to mention ways the students can help take care of wildlife or public lands. If you plan to do "Can Do!" project (see the activity in this packet) or a community project to improve wildlife habitat (see **Improving Wildlife Habitat in the Community** in the Project Wild guide) , ask the resource managers for ideas about what your class could undertake.

2. HAVE STUDENTS PREPARE QUESTIONS: Ask each student to write down one question about the management of a specific area or on a specific Alaska ecosystem for which they would like to know the answer, and be prepared to ask this question of the guest speaker.

3. REVIEW PUBLIC OWNERSHIP OF WILDLIFE HABITAT IN ALASKA AND THE JOBS OF RESOURCE MANAGERS: Before the manager speaks, explain that the managers of Alaska's public lands are responsible for making sure that resources are conserved--which means used wisely, or taken care of. They may be wildlife managers, foresters, mining experts, or archaeologists. Discuss why managers need lots of information about ecosystems and must think very carefully about how resources are used. Discuss why managers often make regulations about the use of certain areas or about how wildlife should be treated.

4. SUMMARIZE WAYS THAT STUDENTS CAN HELP MANAGERS TAKE CARE OF WILDLIFE AND ECOSYSTEMS: Help them think of obeying regulations on using an area, and learning more about wildlife habitat needs and ecosystems.

KEEPING SCORE

Objectives

Students will be able to: 1) describe cause and effect relationships that help and hinder wildlife in their community; and 2) recommend changes in their community that could benefit wildlife.

Method

Students investigate their neighborhoods for "cause and effect" relationships affecting wildlife; develop and use "community wildlife scorecards," and recommend actions to improve and/or maintain the quality of wildlife habitat in the community.

Background

There are pleasant surprises to be found in discovering and exploring some of nature's secrets—and these are available in our own schoolyards, backyards, neighborhoods, and communities. We sometimes forget that nature is all around us—in cities, suburbs, and agricultural areas—and not just in woods and lakes, high mountain meadows, deserts, rivers, skies, and oceans.

This activity is designed to assist students in searching out these surprises, as well as to make them aware of any problems that may exist for wildlife in their near surroundings, particularly as a result of human actions.

Some of us live in areas where limited wildlife is in evidence. However, many of us forget to see wildlife around us, even when it is there. Sometimes it is easy to take birds, butterflies, squirrels, and earthworms for granted! Frequently, we don't take into consideration the impact of our actions on the other living things around us. It is particularly easy to acquire a sort of "selective" vision that has us see aphids in our vegetable patch, for example, and not think about the impact on other life forms in the environment if we use a toxic spray to get rid of the aphids.

The major purpose of this activity is for students to increase their perceptions of cause and effect relationships affecting wildlife in their immediate communities, and to recommend some personal and community actions that could benefit wildlife.

Materials

dittoed or mimeographed scorecards; poster material; chalkboard or bulletin board for classroom display

Procedure

1. Ask the students to go home after school and look for "cause and effect" relationships in their neighborhood or community that seem to help or hurt wildlife—and some that seem not to affect wildlife at all. Ask every student to come back to school the next day prepared to share at least one example.
2. Get a sampling of information from the students in a brief discussion of what they found. Encourage them to explain their bases for

Age: Grades 4—8
Subjects: Science, Social Studies, Language Arts, Mathematics
Skills: analysis, application, classification, computation, description, discussion, evaluation, observation, problem-solving, reporting, small group work, synthesis, writing (limited)
Duration: two to three 30—45-minute periods; time after school working individually or in teams
Group Size: small groups and individual activity
Setting: indoors and outdoors

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identifying "cause and effect." Consider the following:

- What were some of the most surprising observations you made?
- What kinds of actions are people taking that directly affect wildlife? Which, if any, of these actions seem harmful to wildlife? Which, if any, of these actions seem helpful to wildlife? Which, if any, seem to have no effect?
- What, if any, problems affecting wildlife were identified? How do you know there are problems? If there are problems, are they apt to get better or worse in the future? Are there any actions that can be taken—by individuals and by the community—to reduce or get rid of these problems?

3. Next ask the students to work in small groups of four to six students. They should share what they identified as cause and effect relationships and whether the effect hurts or helps wildlife in their community. They can add examples of cause and effect relationships that could help or harm wildlife, even if they did not actually see them happening in their community. They should pool their ideas, eliminating duplicates, and putting their cause and effect relationships on one list representing their group's ideas. Ask one person to report for each group and turn in the group's list.
4. Either the teacher or a small group of students can pool the ideas from all the groups, putting together one master "Community Wildlife Scorecard."
5. Provide each student or team of students with a copy of the "Community Wildlife Scorecard." For example:

COMMUNITY WILDLIFE SCORECARD

NAME _____

CAUSE	EFFECT	HURTS	HELPS	NEITHER	DAY
BIKES RIDDEN FREE	SOMETIMES CHASE DEER AND FELL WILDLIFE	X			MONDAY WEDNESDAY
PERSON PLANTING TREES AND BUSHES	CAN CREATE FOOD AND SHELTER		X		SATURDAY

Read through the scorecard together, making sure the students are clear about what they are looking for in each situation.
6. Decide where the students will be doing their observing and "scorekeeping." It might be on the school grounds. The activity works very well if the students each take their scorecards home with them, making their observations to and from school, and after school in their own neighborhoods.
7. Ask the students to keep a score (tally) of each item they see—overnight, for a period of one week, or longer. (If a class cumulative scorecard is to be kept, prepare and post it in a conspicuous place—on a chalkboard, poster board, or bulletin board, for example.)
8. At the end of the week—or whatever record-keeping period is established—ask the students to tally and score their personal sightings. Subtract one point for every sighting of a cause and effect relationship that hurts wildlife; add one point for every sighting that helps wildlife; zero points for sightings with no impact.
9. Combine the personal scores and come up with a whole class score representing the "Community Wildlife Score."
10. Based on what they observed and recorded, ask the students what actions they think they could take as individuals and as a community to improve their "Community Wildlife Score." If the score is excellent already, what actions, if any, need to be taken to maintain the quality of their environment?

Evaluation

Identify and describe three kinds of wildlife habitat in your community, and list three kinds of wildlife which could live in each habitat.

Describe three actions taken by members of your community that are helpful to wildlife.

Describe three actions taken by members of your community that are harmful to wildlife.

Describe three actions that might be taken in your community which could benefit wildlife, explaining what would happen, and why it would be helpful.

Identify what seems to be the greatest short-term problem for wildlife in your community, and the greatest long-term problem. Identify what might be done, if anything, to reduce or eliminate these problems.

COMMUNITY WILDLIFE SCORECARD

Cause/Effect Relationship	A Subtract 1	B Add 1	C No Impact
Subtotals			

(Subtract Column A from Column B for Total Wildlife Score.)

Total Wildlife Score

WHAT DID YOUR LUNCH COST WILDLIFE?

Objectives

Students will be able to: 1) trace some foods back to their source, including the impact on wildlife and the environment along the way to the consumer; and 2) recommend, with explanations, some food habits that could benefit wildlife and the environment.

Method

Students trace food sources, diagram environmental impacts, and apply the knowledge they gain by making changes in some of their consumer choices.

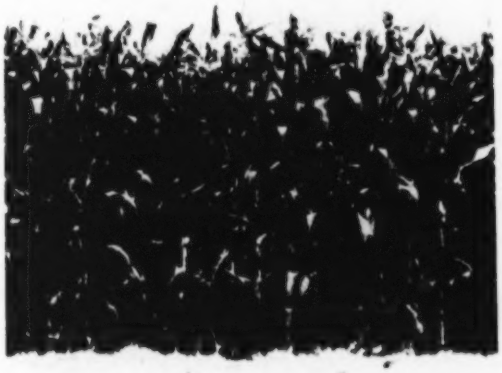
Background

NOTE: Especially for younger students, this activity makes a nice summary companion to "What's For Dinner?"

Most of us make lifestyle choices each day that have some impact on wildlife and the environment. Many of those impacts are indirect, and therefore we are not as aware of them as we might be. The choice of foods we eat, for example, is an area with many implications for wildlife and the environment.

The places and ways in which foods are grown has impact. For example, we know that loss of habitat is one of the most critical problems facing wildlife. Habitat may be lost to agricultural use or development as well as to industrial, commercial, and residential uses. Given that people need food, the ways in which we grow that food —and the ways we care for the land in the process—are very important. Farmers can take measures to maintain and improve wildlife habitat as they grow and harvest their crops. They can pay attention to the impact of their growing practices. Both inorganic and organic fertilizers are commonly used in industrial agriculture. These compounds may run off or leach into water supplies. In lakes, for example, this run-off may contribute to a huge increase in the growth of plant nutrients such as algae. This excess growth can act as a pollutant, poisonous to aquatic animal life such as fish, amphibians, arthropods, and insects.

Use of insecticides and herbicides also affects the environment, including wildlife. Obviously, if pesticides kill and eliminate the food source for wildlife, the wildlife either leaves or dies. Indirect effects can include accumulation of such pesticides in the bodies of animals—as in predatory birds, fish, and mammals, including people.



Age: Grades 4—12
Subjects: Social Studies, Language Arts, Science, Home Economics, Vocational Agriculture
Skills: analysis, application, classification, comparing similarities and differences, discussion, drawing, evaluation, media construction, problem-solving, synthesis, visualization, writing (limited)
Duration: one to three 45-minute periods
Group Size: any
Setting: indoors

Key Vocabulary: organic, inorganic, source, renewable, nonrenewable, impact

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Not all of the impact is due to some farmers' practices, however. Certainly, the transportation, processing, packaging, and marketing industries are involved as well. Questions about the natural resources involved in getting the food from its source of origin to the consumer are critically important. One example is increased exploration for and development of fossil fuels used to transport the food from growing site to consumer, used often to fuel the processing, and frequently used in the packaging, as in the case of fossil fuel-derived plastics.

If the students have concern about adopting lifestyle habits that can be healthful to themselves at the same time they have less impact on wildlife and the environment, they can look at the food they eat as one place to begin. The major purpose of this activity is to provide a means for students to begin that process.

Materials

writing and drawing materials

Procedure

1. Ask the students to generate a list of foods they either brought or bought for lunch. Be sure to include any packaging materials the foods came in.
2. Ask each student to pick one food to trace all the way back to its origins—including where and how it grew, was harvested, was transported, was packaged, and was made available to the consumer. . . the student. Ask the students to make simple flow diagrams of the path the food takes. (The students may want to do some research at this point to get some additional information.)
3. Next ask the students to add drawings of possible and likely impacts to wildlife and the environment along the path their food took to get to them.
4. Ask the students to report back to their classmates—using their diagrams as a visual aid as they describe the path taken by their food, and its impact to wildlife and the environment along the way.
5. Ask the students to discuss and summarize their findings.
6. Ask each student to think of one change he or she could make in his or her own lunch-time eating habits that would be likely to have a beneficial—or at least less harmful—effect on wildlife and the environment. Describe the reasoning for this change, and evaluate its consequences. If, after examination, each change seems in fact to be helpful, suggest that the students try making their changes for a week. At the end of the week, ask the students to report back. Were they able to stick with the change? What happened? If they didn't make the change, why not? Did they forget? If they did make the change, did they find themselves making or thinking about any other possible changes? If yes, what were they?

Extensions

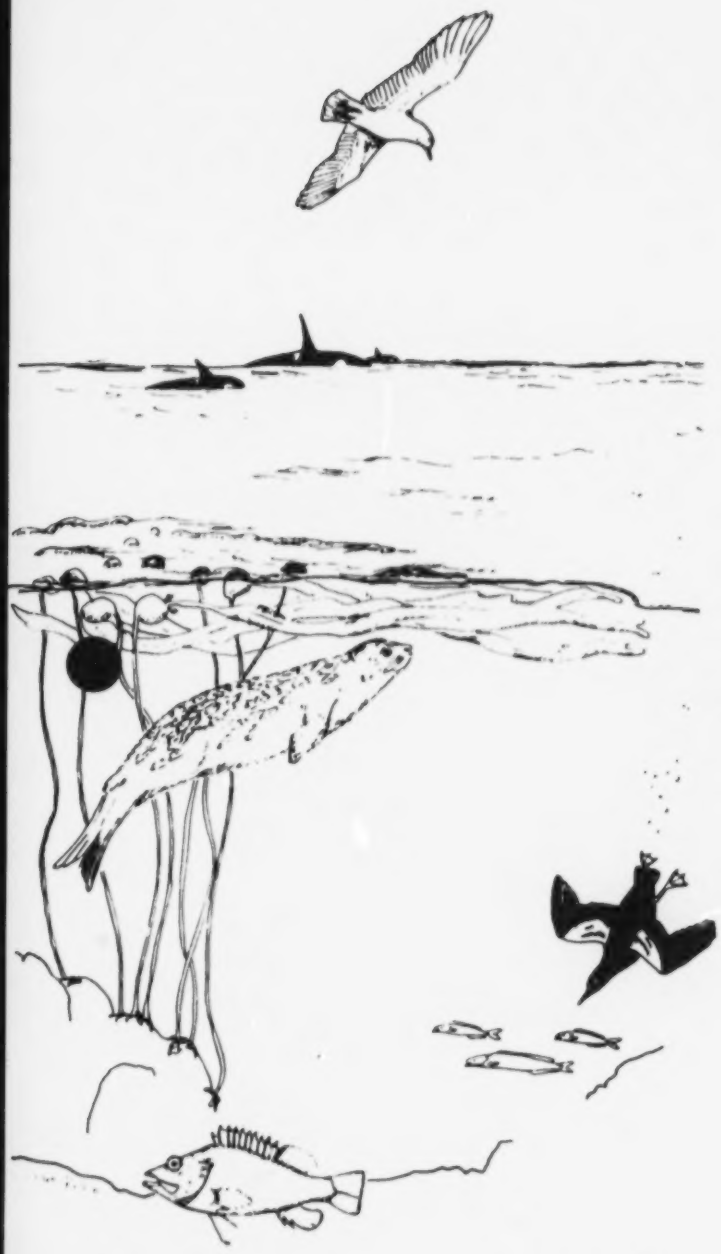
1. Map the **energy** used to grow and get the food to you.
2. Include impact on other specified natural resources along the way.
3. Distinguish between renewable and nonrenewable resources.

Evaluation

Trace the possible course of a container of milk served in your school back to its probable source.

What impact does this journey have on wildlife?

Name three food habits that could reduce negative impacts to wildlife and the environment. Explain the reasoning behind your suggestions.



ENVIRO-ETHICS

SEE THE PROJECT WILD ACTIVITY ON THE NEXT PAGE.

SCIENCE/SOCIAL STUDIES EXTENSIONS:

If you are keeping or planning to keep animals in the classroom, ask the students to come up with rules that the whole class should follow on how to treat these animals (Refer to the Aquatic Projec Wild Guide to see the one developed by the National Science Teachers Association).

If you are planning a field trip, ask them to develop rules for the class on the field trip (Refer to the appendix for an "Etiquette for Wildlife Watchers" developed by the Alaska Department of Fish and Game.

ENVIRO-ETHICS

Objectives
Students will be able to: 1) distinguish between actions that are harmful and beneficial to the environment; and 2) evaluate the appropriateness and feasibility of making changes in their own behaviors related to the environment.

Method
Students develop and use a "Personal Code of Environmental Ethics."

Background
The major purpose of this activity is to provide students with the encouragement and opportunity to look at their own lifestyles in light of their impact on natural resources and the environment.

Materials
none needed

Procedure
1. Involve the students in discussion about the impact each of us has each day on aspects of the environment—from using electricity to make breakfast to putting on clothes that were derived from some natural resources and transported to us by some means, to use of the varied products we choose and employ each day, to our choices of recreation and entertainment. We are consumers, and our impact is formidable.

Age: Grades 6—12
Subjects: Social Studies, Science, Language Arts, Home Economics
Skills: analysis, application, comparing similarities and differences, description, discussion, evaluation, invention, problem-solving, reporting, synthesis, writing (optional)
Duration: one or two 30—45-minute periods
Group Size: any
Setting: indoors or outdoors

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2. Ask each student to work alone to devise a "Personal Code of Environmental Ethics." This code may be written or not. Emphasize the importance of the code being for the person who creates it. The code should take into consideration daily actions that are harmful to the environment, and those which are beneficial; the students should consciously create their code based on actions they believe are beneficial, or at least not harmful, to elements of the environment. We will always have some impact; we can make choices about the kinds of impacts we make, their extensiveness, etc.
3. Ask for any volunteers to share their "Personal Code of Environmental Ethics." They might share the entire code, or a segment of it. They might describe the thinking that went into the decisions they made in constructing their code. Students might illustrate a part of their code—if they chose not to write it—to convey a major idea. Encourage the students to ask each other questions about the codes, in the spirit of learning more about each person's priorities, but not in a judgemental approach. The purpose is for each student to evaluate his or her own priorities, in a responsible consideration of day-to-day actions that affect the environment, but not to be actively critical of another student's approach to the same problem. In this way, each student is simply encouraged to take responsibility for his or her own actions.
4. Encourage the students to try using their codes, keeping track of how easy or difficult it is for them to live by them. "Progress reports" are appropriate, again in the spirit of each person paying attention to his or her own actions, and bearing responsibility for them.

Variations and Extensions

1. Reflect for a few minutes on your daily life. In fact, close your eyes and follow yourself through a typical day. What natural resources do you use? What choices do you make that have an impact on the environment? If you could, what things—if any—would you change about your daily life in order to have a more beneficial, or less harmful, impact on the environment? What things—if any—do you already do that you think are helpful, or at least not harmful, to the environment? Brainstorm ten words that come to mind when you think of actions and behaviors you value. Create a sentence, paragraph, or poem that might capture the essence of your own "Personal Code of Environmental Ethics."
2. Develop a "life map." It could include where you want to live, whether you want a family, what kind of home, transportation, food sources, job, recreation, etc. Look at the costs and benefits of your choices—for you personally, other people in your community, wildlife, other natural resources, etc.

Evaluation

List five environmental issues.

List one way that you directly or indirectly contribute to an environmental problem.

Identify, describe, and evaluate one way you could lessen your role in contributing to an environmental problem.

Make at least one change in your lifestyle that will reduce your role in contributing to an environmental problem.

FRIEND OF THE ECOSYSTEM • SOCIAL STUDIES / ART

OBJECTIVE: Students will think about their personal responsibilities to care for Alaska's wildlife and ecosystems.

Materials: None

Procedures:

1. DISCUSS OWNERSHIP OF ALASKA'S LANDS. Ask students what they should do with things they own -- such as a plant, a pet, a yard, or a garden. (They should recognize that they have to take care of these things.) Review the fact that much of Alaska's lands belong to the public -- and that includes them. What should they do since they own much of Alaska's lands?

2. HAVE STUDENTS REVIEW THINGS PEOPLE DO FOR THEIR EFFECTS ON THE ECOSYSTEM: Using the Human Action Cards, have the students determine the things people do that help or hurt the ecosystem. Then discuss whether those things that harm the ecosystem should be allowed, but controlled, and which should not be allowed at all.

3. DISCUSS HOW STUDENTS COULD HELP AN ECOSYSTEM:
Discuss whether students do some of the listed activities. Do they do any of the things that help wildlife or the ecosystem? Do they do anything that requires someone else to harm wildlife or the ecosystem?
Compare the use of things from the ecosystem that are renewable (e.g., wood, berries) to resources that are not renewable (e.g., oil and gas, minerals). Add a third category to the board: "Things We Must Do Carefully;" help students recognize the some human activities which use renewable resources and which can harm wildlife should be listed in this category (e.g., wood harvest activities).

4. HAVE THE STUDENTS WRITE A "FRIEND OF THE ECOSYSTEM" PLEDGE.
Discuss the idea of a pledge (the pledge of allegiance or scout's pledge could serve as examples of pledges). Ask students what they think would be a good pledge for a "Friends of Alaska's Forests Club" (or "Friends of Alaska's Wetlands" or "Friends of the Tundra").

ART EXTENSION:

Have students make a button or patch for members of the Friends club.

Lesson 4

OBJECTIVE:

Students will carry out a project to help wildlife or will research and devise a solution to an issue related to wildlife management.

BACKGROUND. This unit includes several ideas for your class to carry out a project that will help wildlife on your school grounds or in your community.

A well-designed class project should enable students to:
1) learn and practice science skills by defining a problem or issue and gathering data,
2) learn and practice citizenship skills by role-playing in political processes that devise solutions, and
3) carry out a "hands -on" class project that is the solution.
The index included in this unit lists the Alaska Wildlife Week activities related to these skills.

Selecting a Problem or Issue

In the process of carrying out an issue-related project, selection of the issue or problem is key. While this unit includes several specific projects which may work for your class, you may need to select a different issue or topic that is relevant to your local community and which can be devloped into a project that is "do-able."

Topics that are both locally important and interesting to the students have the best chance of developing into successful projects. Giving the students a role in selecting the topic can ensure the latter, however you can guide them in selection based on your assessment of the significance of the issue and the information that is available.
(See the index in this unit for past Alaska Wildlife Week materials with information on specific issues or topics.)

One aspect of wildlife-related issues in Alaska is the often high degree of controversy and polarization of opinions within small communities. Locally controversial issues should not be avoided, however, care must be taken to ensure that all views are presented fairly and activities are designed to teach students critical thinking and problem-solving skills, rather than a specific point of view.

Issues vs. Projects

It may not always be possible to select a topic that will provide both issue-oriented activities and a "hands-on" project, particularly if you would like your students' scope of recognition of problems and their problem-solving to extend beyond the schoolyard and community. Even if students can't carry out their "solution," they can gain by learning how to integrate scientific data into social problem-solving situations and by expressing their opinions and conclusions in a variety of ways.

Litter Clean-ups

This year, we are highlighting one significant problem for wildlife, that of litter that can entangle fish or wildlife or be mistaken for food items.

National legislation was passed in 1988 to help control marine litter in our oceans, but solving the problem depends on efforts by citizens to change their habits of disposing of plastic and to clean up plastic that washes up on beaches. "Plastic Jellyfish" (from the new Aquatic Project Wild book), is included in this lesson as an example of an activity that is good preparation for a project to initiate or participate in a community beach, stream, or general litter clean-up.

Governor Cowper has declared May, 1989, as "Marine Litter Clean-up Month" in Alaska. Contact your local clean-up coordinator for information on how your class can be involved. If you don't have a local coordinator or don't live along the coast, pick an area where a clean-up may benefit wildlife and organize your class to carry it out.

Additional Project Wild activities related to potential projects for your class include **Litter We Know** and **Environmental Barometer**.

1989 Clean-ups Scheduled:

Kachemak Bay Coast Walk
and clean-up April 29
Contact: Jo Anne Popham 235-6667

W. Prince William Sound June 3-4
June 10-
Contact: Rita Hendrickson 561-1622

E. Prince William Sound early May
Contact Stan Stevens, Cordova

Juneau Beach Clean-up May 13
Contact: Bonnie Lippett 586-8762
Juneau Community Clean-up May 12
Contact: Judy Kennedy 780-4333

Petersburg April 24-31
Contact: Merilee Jones 772-3841

Ketchikan May 5-13
Contact: Tonya Henderson
225-2148

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CAN DO!

Objectives

Students will be able to: 1) identify a problem involving wildlife on their own school grounds; 2) suggest and evaluate alternative means by which to either solve the problem or at least improve the situation; 3) successfully undertake the project; and 4) analyze and describe the process by which they successfully solved the problem or improved the situation.

Method

Students select a school environmental project; conduct research; make plans; and follow procedures to accomplish the project.

Background

Each of us can make constructive contributions to improving the environment in which we live. Sometimes our actions can improve the environment for people, sometimes for wildlife, and sometimes for both. Sometimes our effectiveness can be improved if we work with other people—sharing ideas, information, and skills.

A working knowledge of the following terms will be useful to students in this activity:

Problem—a difficult situation to be improved, or an opportunity to make things better. Problems can't always be "solved," but situations can usually be improved.

Authority—an individual or group of people with the power to make changes.

Compromise—a way to settle a problem in which both "sides" usually give a little.

Given that it is important for young people to learn that they "can do" for people, wildlife, and the environment—use your judgement in the course of this activity to assist students in selecting a project that is realistic, constructive, and possible. If not, the students may experience an activity that contributes to their thinking that they "can't do."

The major purpose of this activity is to provide students an opportunity to experience success in taking constructive actions to improve the environment for people and wildlife.

Materials

writing materials

Age: Grades 2—9
Subjects: Social Studies, Language Arts, Science
Skills: analysis, application, description, discussion, evaluation, invention, listing, public speaking, problem-solving, small group work, synthesis, writing
Duration: minimum of three 45-minute periods
Group Size: any
Setting: outdoors and indoors

Key Vocabulary: problem, authority, compromise, constructive, realistic, effective, alternatives

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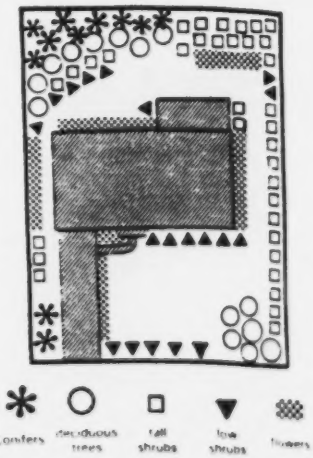
Procedure

1. Ask the students to think of some ways in which they could improve areas of the school grounds as a home for wildlife. They might generate a list of activities on their school grounds that have a negative impact on wildlife. The list might include litter that poses a hazard for some kinds of wildlife; a muddy area that birds use for water but that has been recommended for blacktopping to minimize dust and mud; a proposed pesticide spraying that will not only kill the "pest" but perhaps affect other plants and animals; removal of a tree that presently helps contribute to cleaning the air, produces oxygen, and serves as a food and shelter source for varying kinds of wildlife, etc.
2. Looking at the list of possible problems and suggestions for ways to improve wildlife habitat at school—ask the students to select one they think they could realistically handle and dc something constructive about. If there is difficul ty in deciding which one, and reasonable support has been offered for each, the students might vote to decide. Students could also make speeches in support of the project they want to tackle, in hopes of swaying the class vote.
3. Once the project has been selected, ask the students to work alone or in small groups to begin to generate ideas for possible solutions to the problem and ways to implement the project. Each individual or small group could come up with a plan, including a written description and illustrations or sketches of how it will work, and how it can be accomplished.
4. Ask the groups to present their plans to the rest of the students. Students may ask questions for clarification. Once all the plans have been presented, ask the students to select the plan that seems most: a) constructive; b) realistic; c) helpful to wildlife; and d) apt to make a lasting contribution.
5. Also ask the students to select one or more alternative plans, in case their first choice is not acceptable to authorities at the school.
6. Once a plan, with alternatives for "back up," has been selected—ask the students to select a delegation to present their proposal to the school principal or whomever the appropriate authority would be. Remember janitors, groundskeepers, school board, etc.—anyone who would be physically and/or officially involved. A practice session before the students and any interested parents or other groups of students would be helpful. At the practice session, the student delegation would make their presentation as they plan to before the principal, janitor, etc.—responding to any questions from their audience that might be raised.
7. The students should make an appointment to present their proposal, make the presentation, and report back to their classmates. If their plan is accepted, they should make sure they know who to contact next in order to successfully complete their project. Making sure they have all necessary permissions secured, the students should proceed to successfully accomplish their project.
8. Once accomplished, ask the students to analyze their results. Did things work out like they wanted them to? Were there any surprises? Any unforeseen problems? How might they have been any more effective?

For information on which plants to use to attract or benefit Alaska wildife and for landscaping "how tos," see "Landscaping for Wildlife in Alaska," Wildlife Watcher's Report No. 2. This pamphlet is available at Alaska Department of Fish and Game offices, or write to the Nongame Wildlife Program, ADF&G, 333 Raspberry Road, Anchorage, AK 99518.

To extend the Can Do! project into your community, see the Project Wild activity **Improving Wildlife Habitat in the Community.** The Project Wild activity, **Keeping Score,** can help identify community needs for habitat improvement.



PLASTIC JELLYFISH

Objectives

Students will be able to: 1) describe the potential effects of plastic waste on aquatic wildlife; and 2) identify specific actions they can take to help remedy the problem.

Method

Students monitor the plastic waste production in their own households, research its effect on freshwater and marine life, and propose various ways to lessen the problem.

Background

In both marine and freshwater environments, plastic waste materials have potential negative impacts on wildlife. For example, aquatic animals mistake some plastics for food. In other cases, they become entangled in plastic debris and subsequently die.

The Cousteau Society estimates that six million tons of litter enter the sea each year. Most of this is the product of merchant ships and the practice of dumping garbage in the sea. Among the most damaging kinds of solid waste from litter are non-biodegradable plastics. Plastics simply do not decay. Commercial fishing fleets are estimated to have lost nearly 300 million pounds of plastic fishing gear in 1975 alone. It is this plastic netting material that may be the greatest hazard to marine life. Few fish or marine mammals can swim backward. Once entangled, nearly all animals perish.

Scientists estimate that plastics are killing up to a million seabirds and over 100,000 sea mammals a year. Recently plastics have been found in the stomachs of whales, dolphins, fish, birds, and manatees. Leatherback turtles often mistake plastic bags floating in the sea for jellyfish, one of their favorite foods. As plastics accumulate in the intestines of such animals, starvation occurs slowly.

It is not just in marine environments that plastic litter can be found which has potential to harm aquatic life. Plastic holders for beverage cans, plastic bags, and lost or discarded fishing line on land can all be damaging to wildlife.

Some creative actions are also being explored to use plastics and other materials to enhance, rather than damage, habitat for wildlife. For example, wildlife specialists are experimenting with ways to use plastics intentionally to provide anchoring sites for aquatic organisms in lakes where grasses no longer grow. Some are using

Age: Grades K—12
Subjects: Science, Social Studies
Skills: analysis, application, classification, discussion, hypothesizing, identification, inference, interpretation, observation, problem solving, recognition, synthesis
Duration: one 20-60 minute period or longer
Group Size: any
Setting: outdoors and indoors

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plastic bottles and jugs to provide a microhabitat for certain fish. These actions are beginning to have what appear to be beneficial effects. These positive examples, however, are presently overshadowed by the considerable damage being done to wildlife and its habitat as a result of plastic litter.

There are a variety of sources of useful information about the subject of plastic litter and its impacts. One helpful reference is the publication *Plastics in the Ocean: More Than a Litter Problem*, prepared by and available from The Center for Environmental Education, 1725 DeSales Street N.W., Suite 500, Washington, D.C. 20036. Actions can be taken to help reduce plastic litter and its negative consequences.

The major purpose of this activity is to enhance students' awareness of the hazards of plastic waste for wildlife in aquatic environments, having them explore ways they can take action to reduce its effects.

Materials

plastic waste from home

Procedure

1. Ask the students to collect and save every piece of plastic waste produced in their homes for a two-day period. Have them bring these materials to school. Or, have them bring a sample if the quantity is too great! Caution the students to clean the plastics before bringing them to school so that they are free of food or drink remains. Also caution them about toxins such as ammonia, chlorine bleach, etc. which may be in the containers. These should be emptied and rinsed completely.
2. Ask the students to separate these plastic waste materials into categories. Have them classify them in terms of how they might be perceived by aquatic wildlife as food, e.g. very likely to be perceived as food, somewhat likely, or unlikely. Identify the species that might attempt to eat the plastic. Also classify the materials according to the likelihood of aquatic animals becoming entangled with them and subsequently dying.
3. Ask the students to hypothesize about how these materials might affect aquatic animals. Have them check their hypotheses against current findings reported in the literature, or provide them with sufficient information to do so. Ask the students to summarize what they have learned about the potential hazards to aquatic wildlife from plastic waste materials.
4. Invite the students to survey their schoolgrounds or community for plastic litter. Look to see if and where it exists. Investigate its potential negative impact on animals in the community. If there is damaging plastic litter in the community, ask the students to create an action plan that will increase awareness of the problem and help take care of it, e.g., setting up a plastic recycling depot.
5. Help the students put the plan into effect!

Extensions

1. Contact local environmental, conservation, animal welfare, and wildlife groups to see what is being done about the impact of litter on local wildlife and if specific help is needed.
2. Establish a litter patrol. Designate specific targets such as nearby beaches, lakes, and stream beds. Establish scheduled tours of these areas to pick up plastic and other forms of litter.

UPPER ELEMENTARY

INDEX OF ALASKA WILDLIFE WEEK ACTIVITIES FOR ISSUE-ORIENTED OR PROJECT-ORIENTED TEACHING UNITS

GUIDE TO UNIT AND LESSON REFERENCES:

UNIT 1 - HABITAT	- 1983
UNIT 2 - WETLANDS	- 1984
UNIT 3 - WILDLIFE FOR THE FUTURE	- 1985
UNIT 4 - WEB OF LIFE	- 1986
UNIT 5 - FORESTS	- 1987
LT-UNIT 5 - FOREST LEARNING TRAIL	- 1987
UNIT 6 - TUNDRA	- 1988

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ALASKA FOOD CHAIN AND FOOD WEB EXAMPLES

Six food chain examples for forest, tundra, wetland and ocean are shown in bold letters. Make food webs by using the other foods of each living thing (listed in small letters below its name) to find other interconnections. Use with the activities in Lessons 1, 2, and 3 of this unit. Use information provided on the back of the photo poster (from this and Alaska Wildlife Week Units 1, 2, & 3--check your library). See the 1984 unit for more background on wetland food webs.

	PRODUCER	HERBIVORE	CARNIVORE 1	CARNIVORE 2	DETRITIVORE
FOREST	1. White Spruce	**Red Squirrel** berries, mushrooms	**Marten** voles, bird eggs		**Mushroom** any dead plant
	2. Willow	**Snowshoe Hare** birch, grass, fireweed	**Lynx** voles, squirrels		**Raven** any dead animal
	3. Grass Seeds	**Red-backed Vole** berries, fireweed	**Boreal Owl** flycatcher, woodpecker		**Fly** any dead animal
	4. Lingonberry	**Pine Grosbeak** spruce and birch seeds	**Goshawk** squirrel, flycatcher, woodpecker		**Bacteria** any dead thing
	5. Fireweed	**Moth**	**Alder Flycatcher** flies, beetles	**Merlin** pine grosbeak	**Beetle** any dead animal
	6. White Birch	**Bark Beetles** spruce	**Downy Woodpecker** moth, berries		**Shelf Fungus** any dead wood
TUNDRA	1. Lichen	**Caribou** dryas, willow, sedge	**Brown Bear** sedge, grass, blueberry		**Bacteria** any dead thing
	2. Dryas	**Dall Sheep** willow, sunflower, sedge	**Wolf** caribou, marmot		**Raven** any dead animal
	3. Willow	**Redpoll** willow, sunflower, sedge	**Arctic Fox** singing vole, any dead animal		**Flies** any dead animal
	4. Grass	**Singing Vole** sedge, sunflower, dryas	**Short-tailed Weasel** redpoll		**Springtail** any dead plant
	5. Sunflower	**Butterfly** blueberry, mountain avens	**Golden Plover** flies, springtail, blueberry	**Jaeger** redpoll, vole	**Bacteria** any dead thing
	6. Sedge	**Marmot** grass, sunflower	**Wolverine** fox, any dead animal		**Mushroom** any dead plant
	7. Blueberry	**Willow Ptarmigan** willow, sedge	**Golden Eagle** marmot, weasel, sheep (lamb only)		**Fly** any dead animal
WETLAND	1. Algae	**Water Fleas** dead plants, protozoans	**Stickleback** midge, rotifer	**Common Loon** frog	**Bacteria** any dead thing
	2. Pondweed	**Pintail** algae, seeds of sedges	**Peregrine Falcon** phalarope		**Rotifer** any dead producer, protozoans
	3. Algae	**Midge** algae, dead plants	**Wood Frog** flies, mosquitos	**Sandhill Crane** stickleback, sedges	**Water Flea** any dead producer, rotifer
	4. Sedges	**Muskrat** pondweed	**Mink** stickleback, phalarope		**Bacteria** any dead thing
	5. Willow	**Moose** willow, sedge	**Wolf** muskrat, pintail		**Flies** any dead animal
	6. Algae	**Mosquito Larvae** protozoans	**Red Phalarope** midge, water flea, rotifer	**Parasitic Jaeger**	**Protozoans** any dead material, algae
OCEAN	1. Green Algae	**Sea Urchin** kelp	**Sea Otter** crab, sculpin, sea star		**Tanner Crab** any dead animla
	2. Kelp	**Snails** green algae	**Sea Star** sea urchin, sea cucumber, shrimp		**Flatfish** any dead animal, snails, fish
	3. Diatom (algae)	**Amphipod** other algae, kelp	**Sculpin** shrimp, sand lance	**Sea Anemone** sand lance, snails	**Shrimp** any dead material
	4. Sea Grass	**Brant** green algae	**Bald Eagle** herring, guillemot, any dead animal		**Marine Worm** any dead plant, algae
	5. Brown algae	**Copepods** other algae, sea grass	**Sand Lance** amphipod, euphausids	**Pigeon Guillemot** sculpin, herring	**Sea Cucumber** any dead thing
	6. Red algae	**Euphausids** other algae, diatoms	**Herring** copepods, sand lance	**Harbor Seal** sand lance, flatfish	**Gull** any dead animal

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HUMAN ACTION CARDS - FOREST

Some people cut down trees to get wood to heat their homes.	Some people cut down trees in order to make clearings for farms and to build cities.	Some people leave papers, cans, plastic, and other trash in the forest.
Some people are careless with fires and cause forest fires.	Driving cars around and burning fuel puts a kind of smoke, or pollution, in the air that can kill trees.	Some people cut down, or harvest, trees so that we have wood to use in making paper.
Some people drive cars, trucks, or three-wheelers through forests. This kills some of the trees and other plants.	Some people camp in the forest.	Some people build houses in the forest.
Some people make a lot of noise in the forest and scare forest animals.	Some people mine for metals in the forest. They have to remove the trees and soil.	Some people build roads in the forest. They have to cut down trees to do this.
Some people pick up litter that others left in the forest.	Some people kill all the animals they see.	Some people break off the branches of trees.
Some people plant trees in areas where the trees have been cut down or cleared.	Some people cut down trees to make totem poles, build canoes, or make furniture.	Some people cut off the bark of trees in order to get the materials needed for making beautiful baskets.
Some people are very careful about their uses of paper, and always recycle it.	Some people only drive their vehicles on roads or trails so they won't harm growing plants.	Some people are always careful with their campfires, and always put out all the sparks and coals. This helps prevent forest fires.
Some people put out forest fires started by careless people.	Some people use special kinds of stoves and cars that do not pollute the air as much as other kinds.	Some people are quiet in the forest, and always careful. They try not to break off tree branches, or trample the plants.

HUMAN ACTION CARDS - WETLANDS

Some people drain wetlands so they can farm crops or raise livestock.	Some people place gravel in wetlands so they can have a place to build a house.	Some people leave papers, cans, plastic, and other trash in wetlands.
Some people get rid of polluted water by draining it into wetlands.	Some people leave plastic fishing line along the shore of rivers where animals can get tangled up in it.	Some people don't obey harvest laws and kill all the animals they see.
Some people drive cars, trucks, or three-wheelers across wetlands. This kills some of the plants and may cause gullies and ditches.	Some people gather berries or leaves to make tea in wetlands.	Some people canoe or kayak down rivers and camp along the shores.
Some people make a lot of noise in wetlands and scare wetland animals.	Some people dig ditches in wetlands which drain some parts of the wetland.	Some people build roads across wetlands. They have to put gravel down and birds no longer nest there.
Some people drive their vehicles on wetlands, leaving permanent tracks.	Some people dam rivers to generate electricity. Downstream wetlands dry up.	Some people use streams for drinking water. In times of drought, the streams dry up and fish die.
Some people cut down trees carelessly so they fall across streams and crush streambanks and plants.	Some people fish and hunt in wetlands.	Some people get together to plan how their town will grow and avoid building in wetlands as much as possible.
Some people are very careful about their uses of water and use as little as possible.	Some people only drive their vehicles across wetlands during winter when snow protects the plants.	Some people plan roads so they go don't have to go across wetlands.
Some people use water to mine for gold and put muddy water back into streams that can clog the gills of fish.	Some people use special kinds of stoves and cars that do not pollute the air as much as other kinds.	Some people are quiet in wetlands, and always careful. They try not to break off trample plants or scare wildlife.

APPENDIX

HUMAN ACTION CARDS - TUNDRA

Some people leave papers, plastic, and other trash in the tundra.	Some people build houses, factories, and roads on the tundra. More noise and activity disturbs wildlife.	Some people spray pesticides to get rid of mosquitoes. There are fewer insects and fewer insect-eating birds.
Some people burn gas, oil, and coal to make electricity. Acid rain forms, killing lichens and soil bacteria.	Some people obey harvest regulations for animals such as geese in lowland tundra or goats in the alpine tundra.	Some people put up fences on the tundra. Animals that migrate, like caribou, overgraze their range and many starve.
Some people ignore hunting regulations and kill every animal they see. Musk-oxen, caribou, and goats become scarce.	Some people drive vehicles across the tundra during summer, crushing tundra plants. The permafrost melts and the ground sinks.	Some people drive vehicles across the tundra only during winter when the ground is frozen and there is enough snow to protect plants from being crushed.
Some people gather berries and other food on the tundra.	Some people hunt caribou on the tundra and catch fish in tundra streams.	Some people build oil wells and gravel pads on the tundra. Some birds no longer nest in the area.
Some people strip the plants and soil from the tundra to mine gravel and minerals	Some people are careful to never leave plastic or wire on the tundra which animals could get tangled up in or eat by mistake.	Some people get together to plan how their town or village will grow and use as little of the tundra as possible.

ECOSYSTEM INVESTIGATION--
Ideas for studying the outdoors

The following pages are included to encourage you to get students outdoors to see and observe an ecosystem first hand. Each section includes suggestions on how to look for, and find, a variety of living things. All of the suggested equipment, excepting a microscope and binoculars, can be jerry-rigged from materials or supplies that are easily available. Students are likely to be amazed at the variety and abundance of living things just outside the door. (You might try some of the same experiments inside,too. How many fungal spores are right in your classroom?)

You can join with another teacher to set up study stations for students, or take several trips outside and do one investigation at a time. Some field guides are listed below. Additional references are listed on the inside of the back cover of this guide. See also the Materials Guides that were in the 1983-1985 Alaska Wildlife Week materials (which should be in your library.)

Don't hesitate to ask local experts for help in identification and appreciation of the ecosystem. Many biologists, naturalists, and sportsmen are happy to help students learn more about the outdoors.

ECOSYSTEM INVESTIGATION--THE NON-LIVING SURROUNDINGS

INVESTIGATING THE SOIL---Dig a small hole in the ground so that students can see a cross-section of the soil 30 cm (about12 inches) deep. Note that the has soil layers that look different in color or texture Soil color tells much about the make-up of the soil. The more organic matter in the soil, the darker brown or black it is. Large amounts of iron will make the soil appear reddish or orange, while large amounts of copper will give it a greenish tint. Soil texture: Wet a sample of soil from the top layer and rub it between your fingers. How does it feel? Grainy? Spongy? Slippery? If it feels grainy, it has a lot of sand in it. If it feels spongy, it has a lot of organic material. If it feels slippery it is a clay soil.

In part, the amount of water in the soil depends on how recently it rained or the snow melted, but the make-up of the soil is also very important. Soils with a lot of organic matter hold more water than soils without organic matter. Clay soils also hold a lot of water, but they bind it so tightly that most plants can not use it. Plants have to have water to absorb minerals from the soil. Plants grow best in soil that is rich in organic matter, but also well drained so that detritivores can break down the organic material and make it available to the plants. Sandy, organic soil provides these conditions.

INVESTIGATING THE AIR--Encourage students to note the color and smell of the air. The amount of nitrogen, oxygen, carbon dioxide, and other gases in the air are impossible to measure unless you have very sophisticated equipment. However, a simple test will show students how much dust and pollen are in the air. Spread petroleum jelly on several cards then place them in a variety of places (on a tree, building, near the ground, along a road). Leave the cards out for a day. Then examine the cards carefully.

INVESTIGATING THE WATER--Encourage students to note the presence or absence of water, and the amount of area covered by water, and whether the water is moving or not.

INVESTIGATING THE ENERGY--Students can find out roughly the amount of light energy in a particular location by holding up a solid object (such as a book) and noting the kind of shadow it casts. If the shadow is sharply defined, there is a lot of light. If the shadow is hard to see, there is a moderate amount of light. If you can't see any shadow, there is little light. (If you have a light meter (or a camera with a light meter) you can take a measurement of the amount of light. Encourage students to note that light levels are higher out in the open, away from tall plants. Have them compare the numbers and kinds of plants in sites with high and low light levels.

Have students measure the temperature of the air, the soil (at the surface and under the surface), the water. Encourage them to compare the temperatures of the air, soil, and water indifferent areas.

ECOSYSTEM INVESTIGATION--Monerans and Protists

LOOK FOR SIGNS--All individual monerans and many protists are microscopic, but en masse, it is possible to see some kinds. A scum on the surface of the water is a good sign that bacteria or blue green algae (or cyanobacterium) are present. A greenish or brownish slimy coating on an old log or on a rock is evidence of cyanobacterium or algae. Many bacteria help to decay dead leaves. Look for a dead leaf that has decayed so that all that is left is a fine meshwork of veins. That is evidence of bacteria at work.

LOOK FOR THE ORGANISMS--In order to see microscopic organisms, you need to use a microscope. Collect samples of soil, water, moss, tree bark, and dead leaves. Place a tiny bit of each one on a microscope slide, and add a drop of water. Examine the slide under high power.

ASK EXPERTS--A microbiologist is a scientist who studies microscopic living things. You might find one at a university, offices of the State of Alaska Dept. of Environmental Conservation, U.S. Environmental Protection Agency, or local health service. You could ask them about the bacteria, cyanobacterium, algae and other protists of your area. They might have pictures or samples of some they could show you.

HOW ABUNDANT ARE THEY-- Count the number of organisms on each slide you prepared and record this. Multiply the number of monerans and protists on a single slide times the number of slide samples in a tablespoon to estimate how many microscopic organisms are in a tablespoon of soil.

ECOSYSTEM INVESTIGATION--Fungi

LOOK FOR SIGNS--Most fungi help to decay or rot dead organisms and waste materials. Look for evidence that a log is decaying, or leaves are rotting away.

LOOK FOR THE ORGANISMS--You are likely to find fungi anywhere that dead plants are found. They are more likely to be growing in a moist spot. Look for old dead trees. Examine an old log carefully. Dig into the leaf litter on the ground. You are looking for anything that is spongy (mushrooms and shelf fungus), that looks like dust (a mold), or like a clear or milky jelly (a slime mold). Examine any that you find with a hand lens. A special type of fungi grow together with certain algae and cyanobacterium to form lichens. These can be found just about anywhere. Look for them on the surface of rocks, on tree branches, and on the ground. An easy way to recognize a lichen is that it is brittle and easy to break if it is dry, but will gradually become flexible if you wet it.

TRY TO GROW SOME FUNGI--Many kinds of fungi are hard to find except during certain seasons when they send out fruiting parts that produce their spores. A mushroom is an example of a fruiting part of a fungi. The fungi is there growing underground all year round but you may only see mushrooms in late summer. You may be able to grow some of the fungal spores that are around(see the diagram below).

ASK EXPERTS--A mycologist is someone who studies fungi. You might find a mycologist at a local university.

HOW ABUNDANT ARE THEY? Count the number of fungi that you can see in a 50 cm square area. (Since some fungi may only be found in certain seasons, you might want to come back and take the same measurement at different times of year.)

HOW TO MAKE A FUNGI GARDEN

1. Mix up a growing medium. Boil 1 quart of water. Add 11/2 tablespoons of malt (same kind that is used in milkshakes) and 1 package of unflavored gelatin. Stir constantly until mixture boils. Boil 1 minute. Pour into several small jars or dishes. Cover well with plastic and let sit until mixture gels.

2. Set the dish of growing medium out in your plot. Remove the cover and leave it for 24 hours. Replace the plastic cover. Place the entire unit in a warm moist place and observe what happens during the next week.

ECOSYSTEM INVESTIGATION--Animals in the Soil

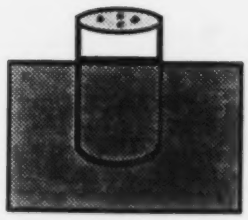
LOOK FOR SIGNS--Many kinds of animals, including insects, snails, spiders, isopods, and small mammals live underground. If studentsu just glance at an area they may not notice that any are present. Have students examine a 1m x 1m area carefully. Look for small holes or tunnels into the ground, droppings, or leaves that seem to have a bite taken out by a small animal.

LOOK FOR THE ORGANISMS--Use an empty can as a sampling tool. Have a student press the open end into the soil until the can is at least half full of soil. Mark the can so you will know later how much soil you collected. Take the soil back to the classroom in a plastic bag. You can place it in a tray and sort through it. Or, set up the Berlyse funnel shown on the right. Leave the light on overnight. Many of the living things in the soil will move away from the warm bright light and fall into the collecting bottle.

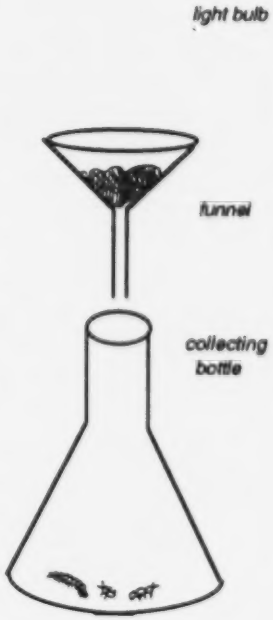
ASK EXPERTS--An invertebrate biologist is a scientist who studies animals that do not have backbones (like insects, mollusks, crustaceans, and worms). Entomologists are scientists who study insects. Either of these kinds of scientists could probably tell you some of the organisms that are found in the soil and they might be willing to help your students identify the ones they find. They might also have specimens for students to look at. You might find such a scientist at a local university, an office of the U.S. Dept. of Agriculture (includes the U.S. Forest Ser- vice), or the State of Alaska, Division of Agriculture.

HOW ABUNDANT ARE THEY? 1. Find out how much soil students collected. (Fill the sampling can up with water to the same level as the soil sample. Measure how much water this is in milliliters using a graduated cylinder--or a measuring cup.) One millliter equals 1 cubic centimeter. 2. Count the number of organisms you found in the sample. By dividing this number by the number of cubic centimeters of soil sampled, you can find out how many soil organisms there were per cubic centimeter of soil.

Soil Sampler



Berlyse Funnel



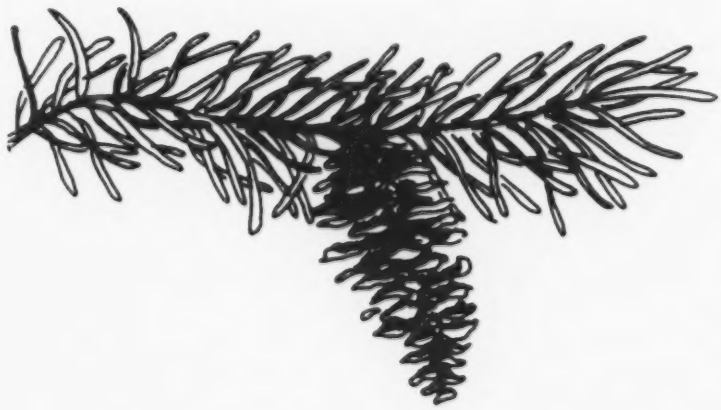
ECOSYSTEM INVESTIGATION--Plants

LOOK FOR SIGNS--Depending on the time of year and where you are, many plants may be dormant--so students won't see their leaves, flowers, or even stems. They might find it interesting to find out what plants are in the soil as seeds. Take a small sample of soil back to the classroom, or collect a variety of seeds from the ground and take them along with the soil. Put the soil in an open container (an old milk carton, for example). Then, water the soil well, cover it with plastic and place it in a sunny spot. Watch closely for 2-3 weeks.

LOOK FOR THE ORGANISMS--Plants are probably the easiest living things to observe and study. Students can see them easily and they can't move away. But it is easy for students to overlook the number and variety of plants unless they look carefully. Be sure they look for mosses, ferns, and horsetails as well as conifers and flowering plants (see the poster if you don't know what these are).

ASK EXPERTS--Scientists who study plants are called botanists. You can find botanists at universities and at the State Dept. of Forestry and U.S. Forest Service. Most biologists can identify plants, so you might check with the Alaska Dept. of Fish and Game or U.S. Forest Service for help. Local nature clubs may have people who are interested in, or study plants, too. They might be able to help you identify some of your plants.

HOW ABUNDANT ARE THEY-- Have students count the number of each kind of plant that students found in a 1 m x 1 m area and record this number next to the drawing of that plant. Be careful to count individual plants, not every individual leaf or stem.



LOOK FOR SIGNS--Often, it isn't easy to see the birds and mammals that live in an area. Many move around over large areas and try to stay hidden. But they leave signs of their presence. Look for animal droppings, tracks, hair or feathers, plants that have been nipped or browsed, nests or dens. A book that will help you identify animal sign is A Field Guide to Animal Tracks by Olaus J. Murie.

LOOK FOR THE ORGANISMS--The most important thing to remember when you are looking for birds and mammals is to be quiet--talking and moving around noisily will scare them away. Sit quietly, listen and watch. Try to visit the site in early morning or late evening. Bring binoculars or a spotting scope, if you can.

ASK EXPERTS--Wildlife biologists study birds and mammals. An ornithologist studies birds and a mammalogist studies mammals. You might find these kinds of scientists at your local Alaska Dept. of Fish and Game or U.S. Fish and Wildlife Service office. Or, check with local nature clubs; members of organizations like the Audubon Society may know a lot about the birds and mammals of your area. Sportsmen's groups are also a good source of information; trappers and hunters may know a lot about some of the mammals in the area. State and federal park departments may also have biologists or naturalists on their staff.

CHECK REFERENCES--A good way to find out more about the wildlife in your area is to check books about wildlife, like the Guide to Birds of Alaska by R.W. Armstrong, and A Guide to the Mammals by William H.Burt and Richard P. Grossenheider.

LIVE TRAPPING-- You can live trap shrews and other small mammals by making pitfall traps. Dig a small hole in the ground and set in a small coffee can so that its top edge is even with the ground. Bait with a mixture of peanut butter, bacon fat, and oatmeal. Be sure to put cloth strips or cotton in the bottom of the can so any animal you capture can make a nest and stay warm. Checkyour traps at least every 12 hours. If traps are checked less frequently, the animals you catch may die.

HOW ABUNDANT ARE THEY? Measure a 10m x 10m area, then count the number of each species that you find in that area. Count any sign you see as 1 animal, unless it is clear that there was more than one. For example, if you found 2 sets of moose tracks--one much larger than the other, that would show that there were two moose in the area. But if you found two sets of tracks, both the same size, it could have been the same animal passing through twice. Compare your estimate of bird and mammal abundance with other groups. Could you get a better estimate of abundance using everyone's estimates? Biologists spend a lot of time and money trying to develop accurate ways of counting birds and mammals. You may want to invite local experts to come to your class and discuss with students how they count, or census, wildlife.

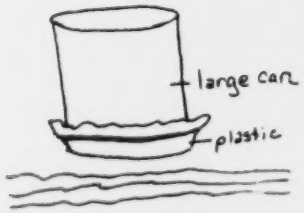
ECOSYSTEM INVESTIGATION: Animals in the Water

LOOK FOR THE ORGANISMS--You can make the underwater viewer shown at right with a coffee can and some clear plastic. Put it on the water surface and look under water for fish, insect larvae, worms, or other creatures. Pick up rocks and look on the underside of them. (Be sure to put them back in the same place so the animals that live there will still have their home.)

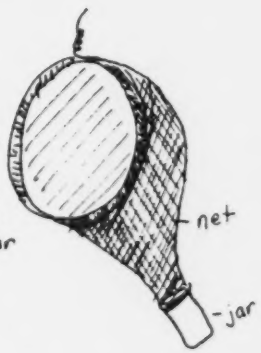
CATCH THE ORGANISMS--The diagrams below show a variety of ways that you can catch animals that live underwater in order to look at them more closely. Be sure to return them to their homes after examining them. Check your library for books on identifying insects and other invertebrates.

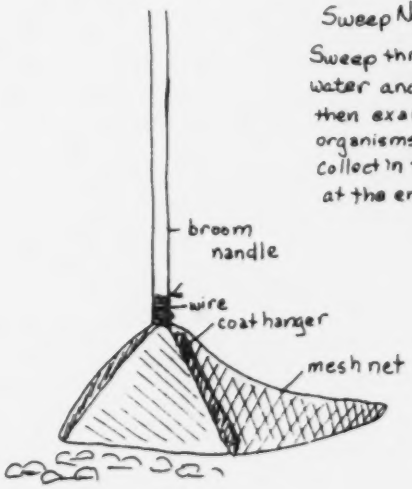
ASK EXPERTS-- You can find fisheries biologists at your local Alaska Dept. of Fish and Game or U.S. Fish and Wildlife Service office. Since fish eat the other kinds of living things in the water, fisheries biologists will likely be able to help you identify the insects and other invertebrates, too.

MEASURING THE ABUNDANCE OF AQUATIC INVERTEBRATES--Measure the volume of water, or bottom sediment that you collected. Then, count the number of organisms in the sample. Or count the number of organisms found per sample collected. Or, have students count the number of organsims found per rock they turned over.



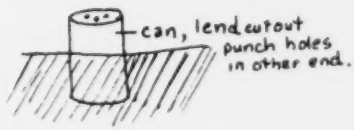
Underwater Viewer





Kick Sampler

Place on bottom of a stream. Kick stream bottom gently. Examine.



Core Sampler

Push down into bottom of stream or pond, then pull up. Sort through sample.

*Check the 1984 Alaska Wildlife Week, Unit 2. Water, Wetlands, and Wildlife for more information and instructions on making and using some of the above sampling equipment.

ETIQUETTE FOR WILDLIFE WATCHERS

Wildlife watchers sometimes unintentionally harm wildlife, ruin opportunities for others to enjoy wildlife, and occasionally place themselves in danger. To avoid these situations, use the following guidelines carefully whenever you observe or photograph wildlife.

MINIMIZE DISTURBANCE OF WILDLIFE

Step softly and quietly while observing animals, replace rocks or logs after looking underneath (to keep the roofs on animals homes), handle animals gently, fill in holes after looking for clams (to prevent suffocation of the animals next door) and don't take live animals or plants away from their homes.

So that other children can enjoy the area, too. Discourage personal collections of any natural items, living or nonliving. Limit collection to educational purposes such as art projects or aquarium study--and return any living animals to their natural habitats as soon as possible. For classroom specimens, preserve only those animals already dead.

Observe animals from a safe distance. Use binoculars, spotting scopes, and telephoto lenses to get a closer look. If an animal shows signs of being crowded or disturbed, sit quietly or move slowly away.

SIGNS YOU ARE TOO CLOSE:

MAMMALS
- Head raised high, ears pointed in direction of observers
- Skittishness-jumps at sounds or movements
- Animal moves away or lowers head, ears back in preparation for a charge,
- Erect hairs on neck and shoulders

BIRDS
- Head raised, looking at observers
- Skittishness
- Excessive preening, or pecking at dirt or foot; bill wiping
- Alarm calls, repeated chirping and chipping
- Distraction display-broken wing, or tail spread

Move slowly, allowing the animal to keep you in view. Avoid sneaking up on or surprising animals.

Limit the time you spend at or near a nest to 5-10 minutes. Do not visit nests during bad weather. Do not disturb the plants around the nest, or handle eggs

or young. Keep far enough away from nesting colonies that you don't flush the birds.

AVOID DANGEROUS WILDLIFE

Familiarize yourself with bear safety. Bears occur in almost every habitat in Alaska. A pamphlet entitled "The Bears and You," available free from the Alaska Department of Fish and Game, provides excellent tips for avoiding bear attacks.

Always keep a good distance between yourself and cow moose with calves. A cow may charge on little provocation and her flying hooves can seriously injure or kill a person.

Encourage students to leave the schoolyard, forest, river or wetland cleaner than when they arrived.

By working together and following these simple rules we can all enjoy Alaska's abundant wildlife today and tomorrow.